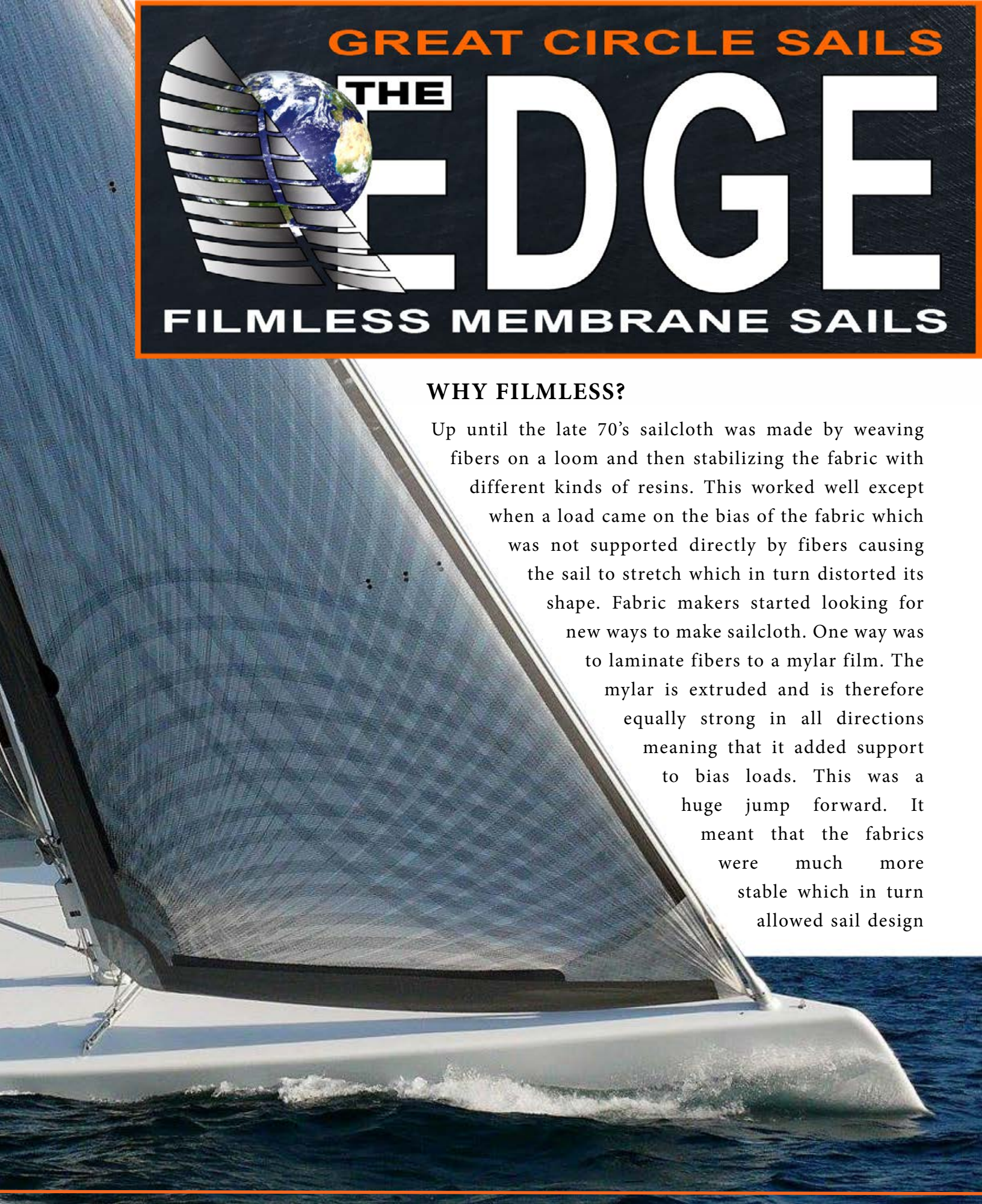
GREAT CIRCLE SAILS

THE EDGE

FILMLESS MEMBRANE SAILS



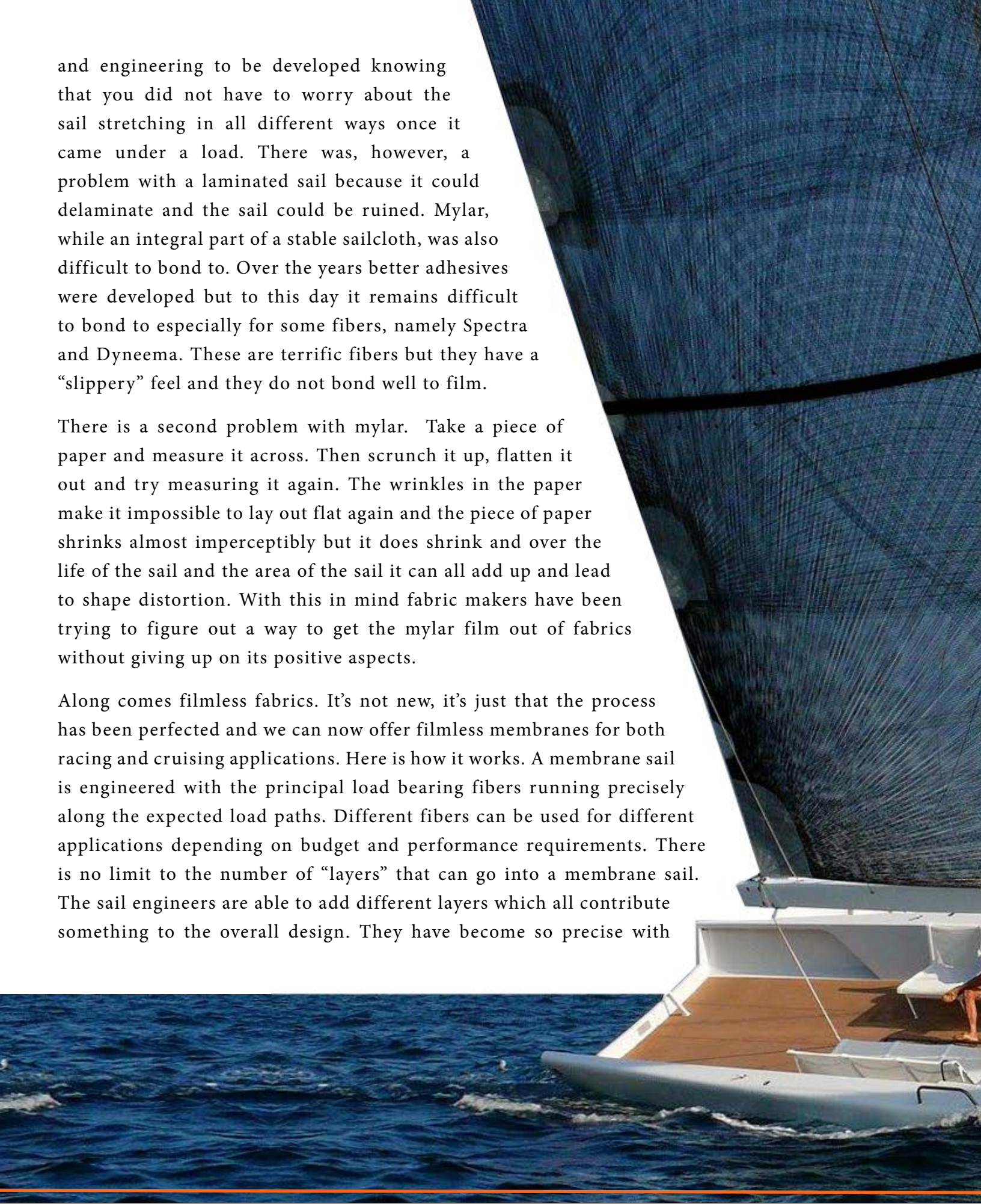
WHY FILMLESS?

Up until the late 70's sailcloth was made by weaving fibers on a loom and then stabilizing the fabric with different kinds of resins. This worked well except when a load came on the bias of the fabric which was not supported directly by fibers causing the sail to stretch which in turn distorted its shape. Fabric makers started looking for new ways to make sailcloth. One way was to laminate fibers to a mylar film. The mylar is extruded and is therefore equally strong in all directions meaning that it added support to bias loads. This was a huge jump forward. It meant that the fabrics were much more stable which in turn allowed sail design

and engineering to be developed knowing that you did not have to worry about the sail stretching in all different ways once it came under a load. There was, however, a problem with a laminated sail because it could delaminate and the sail could be ruined. Mylar, while an integral part of a stable sailcloth, was also difficult to bond to. Over the years better adhesives were developed but to this day it remains difficult to bond to especially for some fibers, namely Spectra and Dyneema. These are terrific fibers but they have a "slippery" feel and they do not bond well to film.

There is a second problem with mylar. Take a piece of paper and measure it across. Then scrunch it up, flatten it out and try measuring it again. The wrinkles in the paper make it impossible to lay out flat again and the piece of paper shrinks almost imperceptibly but it does shrink and over the life of the sail and the area of the sail it can all add up and lead to shape distortion. With this in mind fabric makers have been trying to figure out a way to get the mylar film out of fabrics without giving up on its positive aspects.

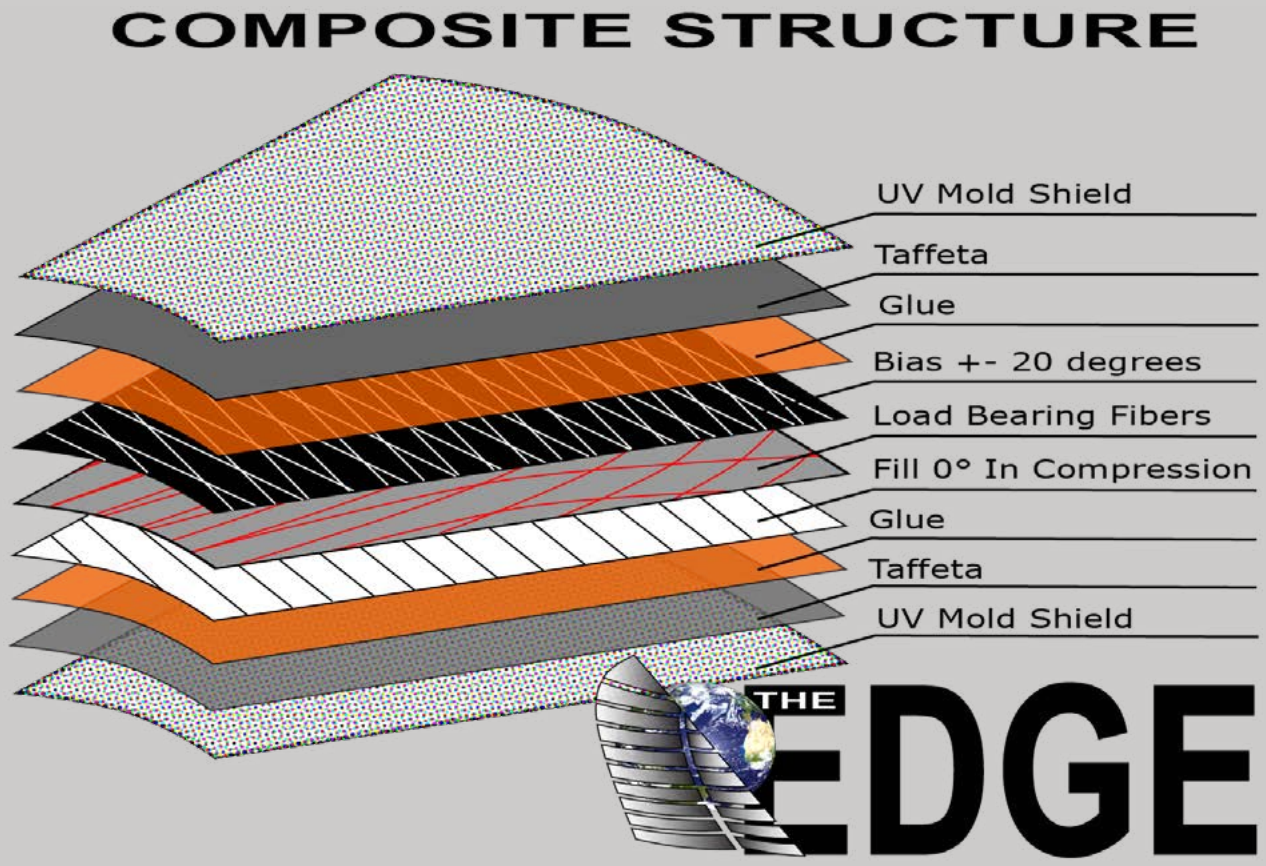
Along comes filmless fabrics. It's not new, it's just that the process has been perfected and we can now offer filmless membranes for both racing and cruising applications. Here is how it works. A membrane sail is engineered with the principal load bearing fibers running precisely along the expected load paths. Different fibers can be used for different applications depending on budget and performance requirements. There is no limit to the number of "layers" that can go into a membrane sail. The sail engineers are able to add different layers which all contribute something to the overall design. They have become so precise with



their engineering that there is no longer any issue with bias stretch and with that issue gone, gone is the need for the mylar film.

Engineering a filmless sail includes creating a core structural grid made from a high modulus fiber that is there to take care of the principal loads. Additional layers are added to provide strength in secondary directions and then the entire grid is encapsulated between ripstop taffetas that have been treated with anti-mildew and anti-UV additives. All these layers are vacuum bagged and cured in a heat-activated cross-polymerization process that fuses all the various layers together into a single membrane which can be up to 25% lighter than a film based membrane with the same strength and stretch resistance.

Great Circle Sails now offer filmless membrane sails to both racing and cruising sailors alike. These sails are on the cutting edge of technology, but are reasonably priced. If you have ever wanted to be at the forefront of sail design and engineering and at the front of the fleet we encourage you to consider going filmless.



For more information or a no-obligation quote please contact
BRIAN HANCOCK
brian@greatcirclesails.com
1 617 271 0712