

# COMPOSITE MATERIALS

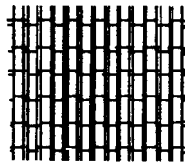
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## RUTAN FIBERGLASS CLOTHS

The most basic structural material in building a composite aircraft is glass cloth. The use of glass in aircraft structures, particularly structural sandwich composites, is a recent development. Glass cloth is available commercially in hundreds of different weights, weaves, strengths and working properties. Very few of these, however, are compatible with aircraft requirements for high strength and light weight. Even fewer are suitable for the hand-layup techniques developed by Burt Rutan for the homebuilder. The glass cloth featured here has been specifically selected for the optimum combination of workability, strength and weight. Two types of glass cloth, a bi-directional cloth (RA7725BID) and a uni-directional cloth (RA7715 UND) are used. BID cloth has half of the fibers woven parallel to the selvage edge of the cloth and the other half at right angles to the selvage, giving the cloth the same strength in both directions. UND cloth has 95% of the glass fibers woven parallel to the selvage, giving exceptional strength in that direction and very little at right angles to it. BID is generally used for pieces which are cut at a 45° angle to the selvage, a bias cut, which enables the builder to lay BID into contours with very little effort and provides the needed shear and torsion stiffness for flying surfaces. UND is used in areas where the primary loads are in one direction, such as wing skins and spar caps. Multiple layers of glass cloth are laminated together to form the aircraft structure. Each layer of cloth is called a "ply".

**UNIDIRECTIONAL P/N RA7715**  
7 Oz. 38" Width Threads per inch:  
80L x 18W .Lineal Yd.

Small Cross Fibers



Selvage Edge

Major Fiber Bundles

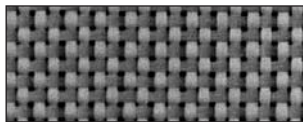


Selvage Edge

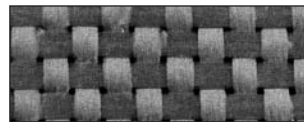
**BIDIRECTIONAL P/N RA7725**  
8.8 Oz. 38" Width Threads/inch:  
54L x 48W . Lineal Yd.

Quantity Discount: 15% on 500 Yds or more. Yardage must be on one fabric for discount, not combined. Discount on larger quantities quoted on request

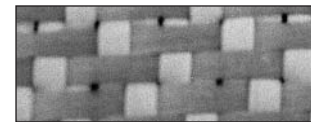
## BIDIRECTIONAL WOVEN KEVLAR



STYLE 120



STYLE 281



STYLE 285

"Kevlar" 49 aramid fiber was introduced commercially in 1972 and is the Du Pont registered trademark for its new high strength, high modulus organic fiber. It combines high tensile strength (43,000 PSI) and high modulus (19 million PSI) with light weight and toughness superior to other reinforcing fibers for plastics. It is available in yarns and rovings which meet all FAA requirements for flammability. It shows no degradation in jet fuel, lubricating oils, water, salt water or high humidity. At cryogenic temperatures (-320°F.) performance is excellent with essentially no embrittlement or degradation of fiber properties. Kevlar 49 can offer both a significant weight saving and improved stiffness versus glass in addition to superior vibration damping and good impact resistance. A kayak made with Kevlar 49, for example, weighs about 18 pounds while the weight of a comparable boat made with glass would be over 30 pounds. The advantages over glass in small aircraft are similar - weight savings and improved impact resistance. Kevlar 49 is used in a number of parts on the Lockheed L-1011 because of weight savings of up to 30% compared to similar parts made of glass. One unusual benefit of Kevlar is its "quietness". A cowling made of Kevlar will be quieter and less sensitive to engine vibrations than its glass or graphite counterpart. Although all of the processes used in combining resins with glass fiber are adaptable to Kevlar 49 with little or no modification. The vinyl estertype system is compatible, but the use of polyesters is not recommended because of poor bonding with Kevlar. The epoxy resin systems featured in this catalog are compatible with Kevlar 49 and have good wetting characteristics.

Kevlar 49 is stocked in three different fabric styles. Kevlar #120 is a very lightweight fabric, while #281 and #285 are identical except for the weaving pattern. Other weights and weaves of Kevlar are available on a special order basis. Be sure to specify the Kevlar style when ordering.

Style	Part No.	Oz./ Sq.Yd	Weight Width	Thickness	W x F	Weave	Breaking Strength Lbs/Inch		Price Per Lineal Yd
							Warp	Fill	
120	01-38100	1.8	38"	.0035"	34 x 34	Plain	260	250	.
281	281-38	5.0	38"	.010"	17 x 17	Plain	625	650	.
285	285-38	5.0	38"	.010"	17 x 17	Crow	630	650	.

Quantity Discount: 10% on 25-50 Yds. %; 15% on 50-100 Yds.; 20% on over 100 Yds.

## UNIDIRECTIONAL KEVLAR



KS-400 is a unique unidirectional reinforcing material combining the benefits of Kevlar 49 with Owens-Corning Fiberglass S-2 Glass. Designed for use in laminates which must have high modulus or stiffness and tensile strength combined with low weight or density. Specifically constructed to enhance properties of wet-out behavior, bondability and impact strength in a hand laid-up composite. As compared with woven fabrics of pure Kevlar, KS-400 should produce laminates with better fiber-resin ratios and superior stiffness. The integrity of KS-400 is maintained through very fine, adhesive coated Dacron fill yarns that are bonded to, but not interwoven with, the unidirectional fibers. Only vinyl esters or epoxies should be used as impregnating resins. The presence of the S-2 Glass enables the fabricator to determine visually when the material is properly wet out. Resin bond is far superior to the glass than to the Kevlar. This means increased resistance to delamination. Also the presence of the S-2 Glass even in such a relatively small amount increases the impact strength of the laminate significantly. In application, it is important that the fabricator does not confuse the appearance of the cross-direction adhesive binder with air bubbles. The impregnating resin will soften this adhesive and it will flow slightly. The adhesive shows up as milky areas on both sides of the fabric within the finished laminate. A gel coat or paint covers these areas effectively. 12" Wide ..... P/N 01-00340 ..... Ft

10% Discount on 50 ft. (4 lbs) • 20% Discount on full roll, 300 ft. (24 lbs)

### OFFSET KEVLAR CUTTING SHEARS



Although Kevlar has many advantages over conventional fiberglass weaves, it is very difficult to cut. Special scissors have been developed to facilitate cutting. These scissors have a wear-resistant coating which is metallurgically bonded

to the steel substrate. The coating will not chip or peel off and can be sharpened.

Model WR-10E-4 Shears ..... P/N 01-00341 .....

Quantity Discount: 10% on 6, 15% on 10



### INDUSTRIAL FABRIC SHEARS

Wiss No. 20W heavy-duty shears, ideal for cutting fiberglass cloth and all fabrics. Hot drop-forged steel.

Right Hand Shears..... P/N 01-00397 .....  
Left Hand Shears..... P/N 01-00398 .....

**ECONOMY KEVLAR SCISSORS** - GINGER® Scissors cut Kevlar exceptionally well. Lightweight, extremely sharp and comfortable, these 2 1/2 oz. scissors are perfect for use during the lay-up. Soak in acetone for easy clean-up. We recommend saving one pair for only cutting Kelvar®, and keep ing a second pair for general use.

P/N 01-00342.....