

# The Enigma Box



by Phil Womack

The Enigma box stems from 7 seconds of footage on the Fano '93 video, available from Drachen. On the video the kite is truly an enigma because being totally black it is so difficult to define its form or design. It instantly became an "I have to have one of those" kites. After much rewinding and numerous freeze frames I worked out the following design.

The enigma box is a reasonably simple kite to make, the hardest part being the marking out and the edge binding of all the curves. If you are not already proficient at using bias binding you will be an expert by the time you finish this project! I constructed the sail from Carrington K42 but from a weight point of view Icarex would be better. The spars are 6mm OD Carbon fibre tube. Since the spar to sail area ratio is high I would not recommend glass fibre tube and, although light, dowel would not be sufficiently rigid.

To begin, mark out all the sail patterns as shown in the diagram. Accuracy is important since the sail is designed so that the tension is spread across the whole kite and each section is dependant on the next. Do not forget to mark lines between points A - B and C - D; they are almost impossible to accurately mark after cutting out. Also, mark the centre points of all the holes in the sails. The curves for the triangular-shaped upper sails and the double-diamond shaped centre sails are formed by bending a piece of 1 - 3 mm diameter fibreglass rod until the desired shape is achieved. The next stage is to cut out the sail parts but leave the circular holes in the main sail until after the edges have been binded as this makes handling the sail much easier.

Before binding the edges it is necessary to reinforce all the points where tabs will be sewn on and the holes for the spars. You could use 60gsm+ ripstop but my preferred material is 4cm wide dacron. My method is to sandwich the sail between two pieces using a dab of superglue to hold them and then sew across the inside edge (the binding will take care of the rest) and trim to the shape of the sail. For the spar holes hot cut out 4 or 5cm squares of dacron, sandwich the sail between and sew on. Mark out and hot cut a 2cm(h) x 1.5 cm(w) hole in the centre of the patch and then sew around 1-2mm in from the edge.

I used 10mm wide polyester bias binding on all the edges. The problem with polyester is that it is very soft and it is impossible to achieve a crisp edge if you only sew it on in the normal way. The secret to a crisp edge is very simple: once you have sewn on a section start again and sew 1-1.5mm in from the outside edge. Once all the edges of the main sail have been binded, do each of the three circles in turn. Another good tip is to only cut out and bind a quarter at time as, once again, this makes the material easier to handle. I have not found a source for polyester edge binding in the UK. If you have similar problems it is available by the roll from Vlieger Op in Holland.

The next step is to prepare and sew on the tabs. Cut 3cm wide strips of ripstop, you will need about 1.5m in all. Fold the edges into the centre of the strip and fold in half then sew the open edge. Hot cut into 4cm lengths and sew to the sails. It is only necessary to have enough of the tab protruding past the sail to allow a piece of bridle line to be threaded through.

Next sew on the four upper sails to the main sail at points A - B and C -D. To avoid any creep in the material I pre-fixed these with a few very small dots of superglue along the seam line before sewing. For obvious reasons the sails need to be placed so that the hem allowance is towards the centre of the main sail. After turning under and sewing the hem, sew tabs to the main sail at points A, B, C and D.



As shown in the illustrations all the tabs require small loops of bridle line which locate in the arrow nocks on the spars. After a few hours flying the sails will stretch slightly so the loops want to be relatively large to begin with. It is far better to be able to adjust the loops later than have to re-spar the whole kite.

The forward and aft upper sails share a common loop as shown. The loops on the centre sails need to be just long enough to larks-head around the main sail spreaders.

Since there are always variations in size when a kite sail is sewn up I will not give the dimensions of the spars, just the order in which they should be fitted. As a general guide, use the sail dimensions off the plan plus tabs and loops, then add a couple of centimetres which can later be trimmed. Remember, the kite needs to be dynamically balanced so cut matching spars to the same length and make any adjustments of sail tension via the loops.

First fit all the longerons to the main sail including the spars between A - B and C - D between the main sail and the rear upper sail. The two spreaders on the main sail are in two pieces. You can either fit these in one piece and cut then later or in two pieces and connect with the spreader joint. Once the main sail spars are fitted you will notice that points A, B, C and D are being pulled into the centre of the kite by the sail tension. This is cured by a length of line fastened between the tabs at A and B and passed through the arrow nock at the end of the spreader. The line length is determined by pythagoras' theorem. Repeat the process at C - D.

Next fit the spreader between the forward and rear pairs of upper sails. Fit an arrow nock to an oversized spar, locate the nock in the loop in the rear sails, stretch the forward sails and mark the spar for trimming. Slide the spar through the spreader joint and fit the arrow nock.

The longerons are now fitted to the centre sails. To fit the centre sails first remove the upper and lower spreaders and slide a 5mm length of 6mm id poly tube onto each spar. Re-fit the spars and position the tube to the outside edge of the longerons. Check symmetry and fix each with a dab of superglue. Release each spreader in turn and larks-head on the front and rear centre sail tips as illustrated. Prepare four pieces of line

with a loop in each end (good old trial and error) and tension centre sails as illustrated. To assist with the rigidity of the frame, remove the main sail longerons and pass through the upper and lower loops on the rear centre sail between the tab and the larks-head.

I have experimented with various bridle set-ups and discovered that a simple two leg coupled with a drogue or two works the best. If anyone who builds an Enigma can get it to fly without a drogue please send me details! The bridle is attached to the main sail longerons approximately halfway between the top end and the crossover point with the upper spreader. Cut four 5mm long pieces of 6mm id poly tube and slide two of each down the longerons. The bridle is larks headed on between them. It is up to you how you drogue the Enigma. Either a single Drogue on a vee line from the lower wing tips on the main sail or two separate drogues attached at the same points will do.

The Enigma can be folded for transport by simply removing the lower centre sail spreader. Release the tension on the upper main sail spreader and remove them from the spreader connectors. Finally ease the centre sail loops over the poly tube stop on one side of the lower spreader. These steps will allow the sail to be folded with all but one of the spars in place. Re-assembly is simple - just reverse the procedure.

Happy sewing.

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