Adhesive Film Covering

pierre rondel

Six years ago Thierry Martinet, a friend of mine who is a graphic designer, decided to investigate with Gerard Prat, an experienced modeller, the use of coloured vinyl adhesive film for covering foam/veneer wings.

This material is usually used for signs, vehicle lettering, windows and even logos on airships! The main advantages of the vinyl are the bright colours, the large colour selection, the excellent life-spans and stability (a minimum of 5 to 7 years, which is much more than the average life expectancy of our gliders - well mine anyway!). In addition they have good plotting and application characteristics.

The thickness is between 0.07 and 0.09 mm, which includes the glue.

The main drawback is the weight, which is around 90 g/m2, when standard covering films are from 50 g/m2 to 70 g/m2 (Solarfilm, Ultracote, etc.), so we can tell that the extra weight is around 20 to 40 g/m2.

But looking at the absolute extra weight for a 3 metre glider (for example) this is not so bad. The covering area for such a glider will be 60 dm2 x 2 (under and upper surfaces) = 1.2 m2. The extra weight will be around 30 g/m2 x 1.2 m2 = 36 grams, which corresponds to only 1.5 % of the final weight of the glider (2.4 kg).

I would say that the excess weight is minor compared to all the advantages of this covering material. But I agree that it's not really easy to imagine how this material can cover a whole wing, especially the wing tips, when we are used to using a similar material in narrow strips on foamies. My objective with this article is to share with you the expertise of Thierry and Gerard (and they encouraged me to do so!). I just hope that sceptic people will be convinced at the end of this paper!

What Film to Use?

There are a lot of different brands and versions of adhesive films but they are not all well suited to our application. The main vinyl brands we use are JAC and Oracal (www.oracal.com). The best ratio of price to quality for our use is the Oracal plotterfoil series 651. Lots of different colours are available in this range.

You can also have a look on the JAC Serilux product range.

If you order directly from the manufacturer the standard roll size is 25 m x 0.5 m. I recognise that it can be a little bit expensive if you just want to cover a rudder or a tailplane! For several years now French kit manufacturers such as Airtech (www.airtech-rc.com) have been selling this vinyl retail at a reasonable price of around £2.40 for 1 m x 0.5 m.

Preparation

Like all covering materials, the final surface finish obtained will depend on your skills, the wood type and the covering material.

A very good surface quality will be difficult to obtain with balsa that is too soft, but it will be obtained easily with harder wood veneer. The best results are obtained with aningre (Latin name aningeria) whose properties give a very strong surface and thin grain (its colour is dark brown). Between these two extremes, obechi also gives really good results with a little preparation. Do not bypass good preparation as the final result is directly linked to the care taken during this stage.

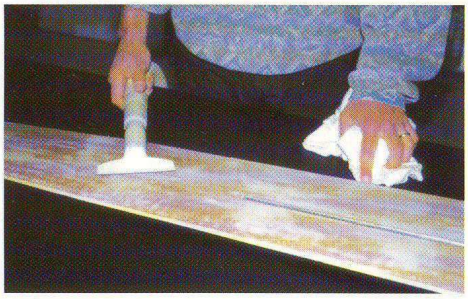
For the preparation of the wing surface we usually use wet and dry abrasive paper, used dry of course! It is very durable and can be vacuum cleaned several times before being retired.

Before sanding, it can be necessary to apply some filler, either to eliminate a large defect or to make the wood fibres almost invisible. Use you favourite brand of filler, ideally with a consistency similar to toothpaste. Its objective is to fill in any spaces between the wood fibres and using such a filler will avoid too much sandpapering and possibly weakening the veneer in your aim to get a perfect finish.

For the best finish, wrap the abrasive paper around a piece of very flexible foam, approximately 10 mm thick. You can then obtain perfect curves (even visible to the eye under oblique light) and an impeccable surface quality. I suggest using grades of 320 to 350 for balsa, 250 for samba and 220 for aningre. Sanding with finer abrasive paper does not produce a better finish after covering.

During its handling the vinyl attracts dust (because of static electricity). The only solution is to transform yourself into

a beautiful cleaning lady and vacuum clean everywhere in the room where you plan to operate.

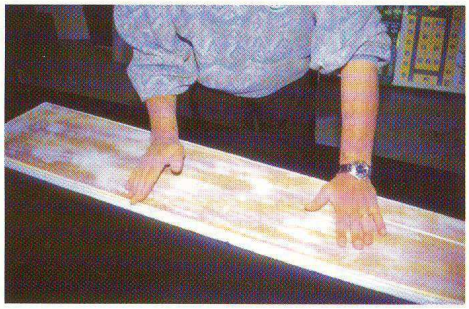


I personally use an ironing board as a worktable because the cotton sheet that covers the table is less susceptible to dust.

Outdoors or in another room thoroughly clean your wings (and wing blanks) with an air compressor or a vacuum cleaner and then finally with a clean rag by 'whipping' the wings (and not by 'rubbing') in order to avoid new static electricity. Never use a wet rag to collect the dust, as the wood fibres will react immediately by inflating and you will certainly have to redo the previous sanding operation.

For the very final cleaning of the surface of the wings simply use your hands. This is, for the moment, the best tool that we have found as it is equipped with very efficient sensors! Actually, you will feel under your hand the smallest amount of dust or roughness. The hand's skin also acts like a fine sandpaper (grain 400 or 600).

Of course, all this advice is also applicable for any type of covering materials, not just adhesive films.



The Tools

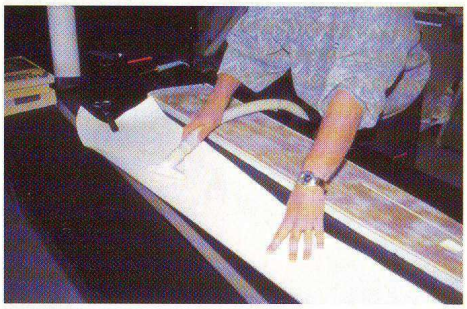
You will need a (preferably) non synthetic rag that does not become fluffy, a scalpel equipped with a fresh blade, an iron as used for Solarfilm, a hairdryer and a soldering iron.

Covering

Firstly, thanks to Thierry Martinet and Gerard Prat who made an exceptional job of taking all these pictures, it's almost as if you were there!

Prior to the beginning of the operation cut your four vinyl panels with the correct planform of your wing, plus a few extra centimetres in both width and length. The longer your wing is (or if it is you very first covering using vinyl) the larger the extra should be. For example, 6 cm extra on each side (leading edge + trailing edge = 12 cm) for a half wing of 2 m is better value than finding you've accidentally allowed too little.

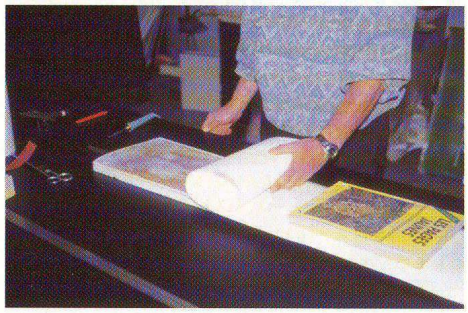
Begin with the covering of the under surface. You can use the wing core blanks to avoid your wing slipping on your worktable, but this is not mandatory.



Vacuum clean the two faces of the vinyl panel before spreading it over the under surface of the wing (still with the backing attached).

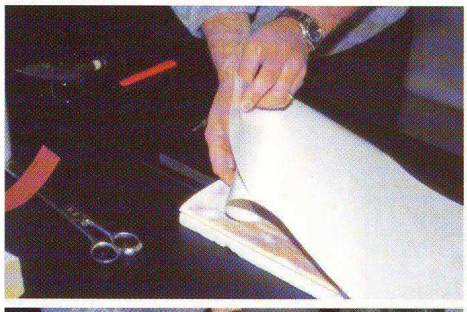
Step 1

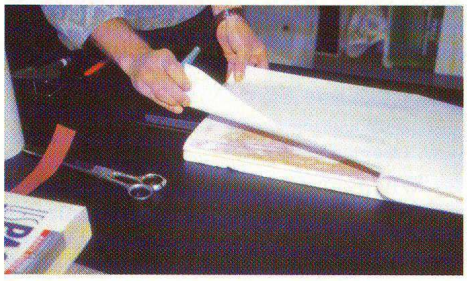
Centre and align the vinyl panel and keep it in place on the wing by using magazines (your entire QFI collection for example!) or telephone directories.



Step 2

Begin the covering at the wing root. Separate the vinyl from its backing paper for about 30 cm and then stretch the vinyl panel applying it progressively, starting at the root chord.

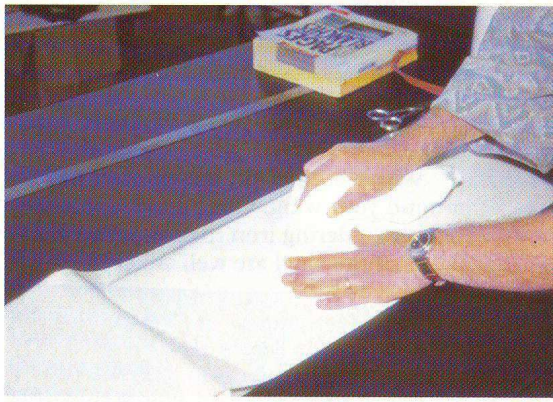




This is the most delicate step as it is necessary to carefully align the wing and the vinyl so that there are no surprises when we arrive at the wing tip. I am sure you know what I mean! Don't hesitate to ask someone to help you for this particular stage.

Step 3

To stick the vinyl to the wing rub it with the rag by starting each time from the middle of the chord towards the leading edge and then from the middle of the chord towards the trailing edge.



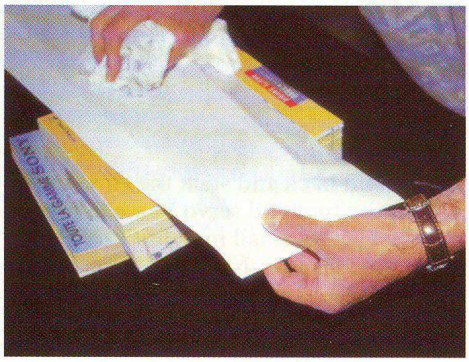
To avoid any creases that would be tragic for the result, progress gradually towards the wing tip sticking the vinyl to the leading and trailing edges (LE &TE) only after the point where you have stuck the vinyl to the middle of the chord. If you progress too rapidly on the LE and TE you are certain to have terrible creases.

Progress that way in steps of around 30 cm.

The adhesive used on the film behaves like all other adhesives and reaches its maximum adherence only after a certain period of time. If something goes wrong during the covering peel the vinyl off immediately, applying a little heat with the hairdryer if necessary. However, even if you don't damage the wood, you will certainly have to throw the panel of vinyl out and do it again with a new one.

Step 4 - Wing Tip Covering

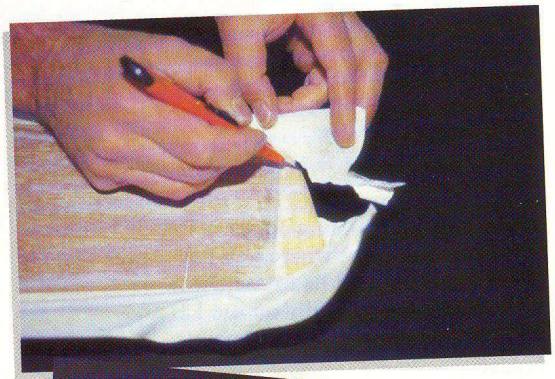
The trickiest stage is the covering of the wing tip. The vinyl is now completely removed from its backing and you should have plenty of excess around the wing tip.

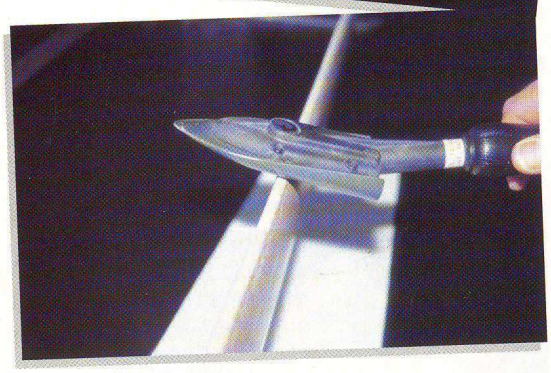


Immobilise the wing on the worktable with something heavy: Then with a hairdryer in one hand, carefully warm the film whilst pulling it with the other hand. You will see that the vinyl becomes soft and can easily follow the wing tip shape.

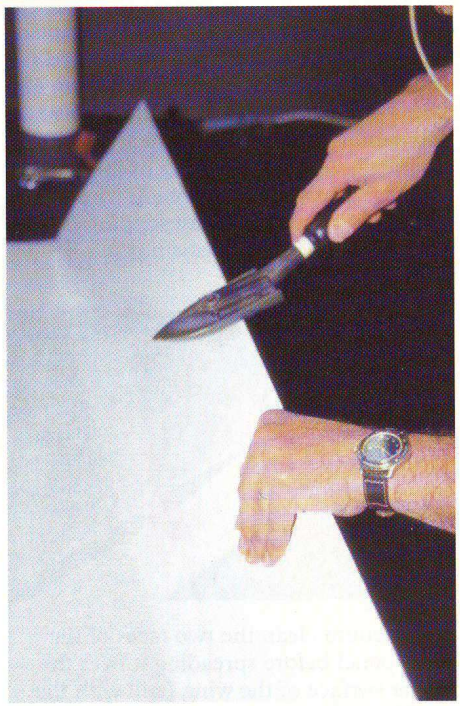
Step 5 - Cut the Extra Vinyl

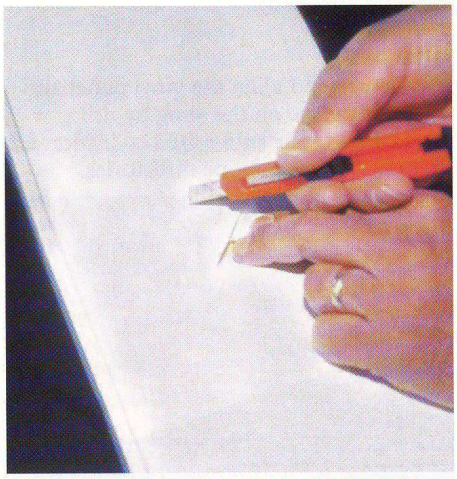
With a scalpel cut the excess vinyl around your wing. Once done, apply the iron or soldering iron to ensure that the edges of the vinyl are well adhered.

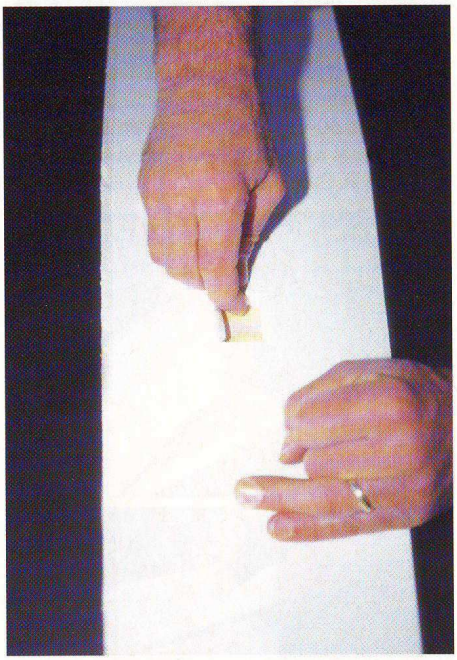




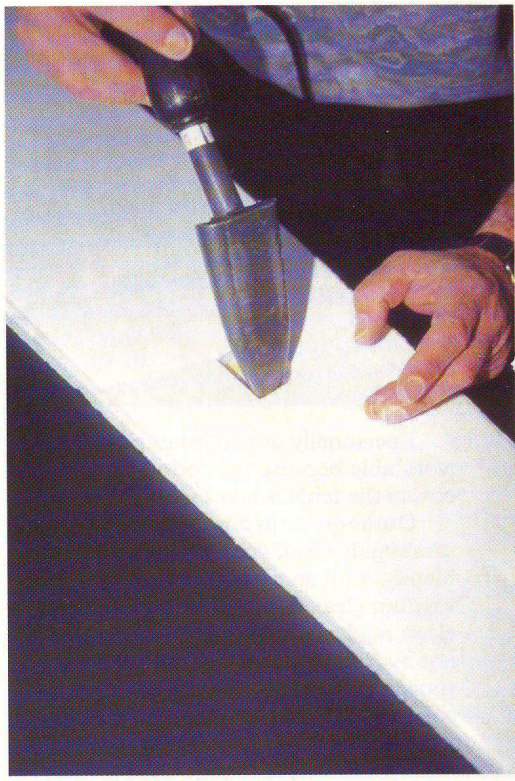
To fold back and stick the vinyl against the root and servo boxes first cut the vinyl with a small margin (3 to 4 mm), then vigorously rub the vinyl on the edge (with the rag or directly with the finger), with heat it will almost mould around any angle.

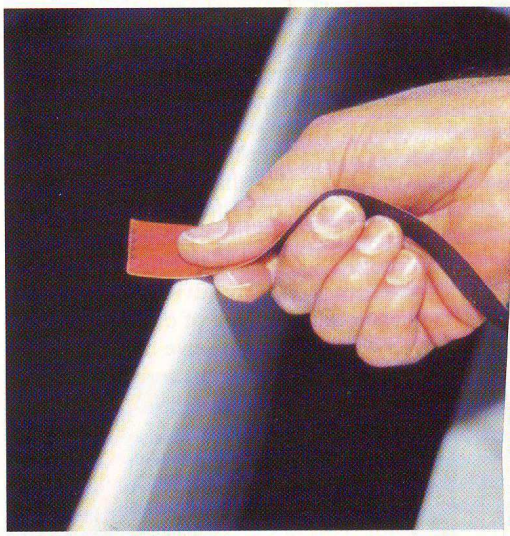






When done you can carefully sandpaper the join line to reduce it an absolute minimum before starting to cover the upper surface.





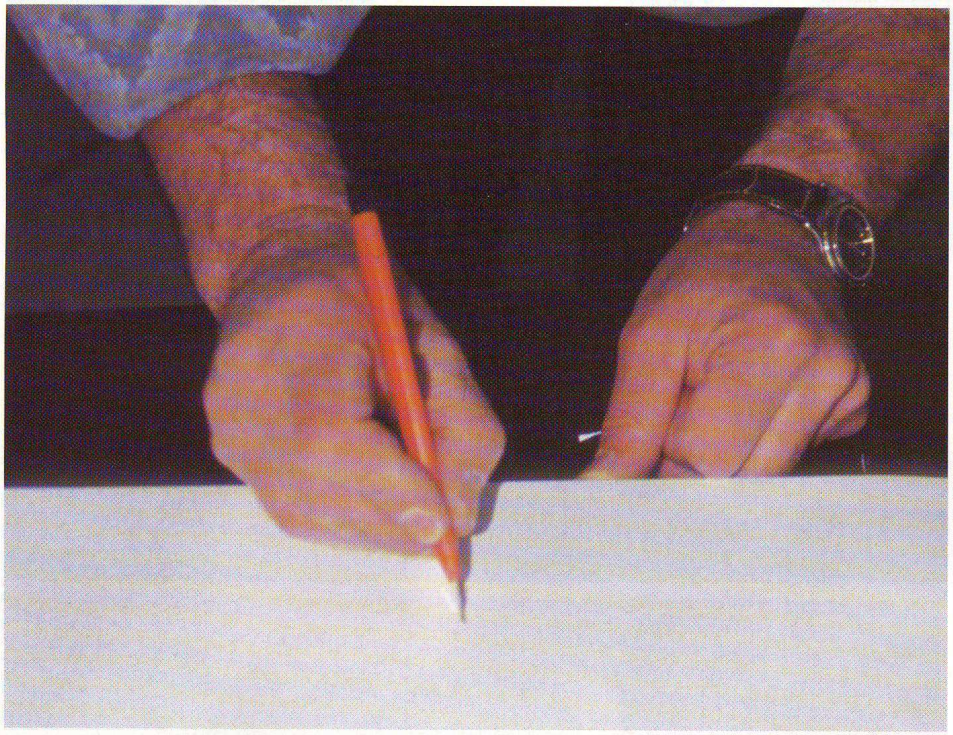
Step 6 - Upper Surface Covering

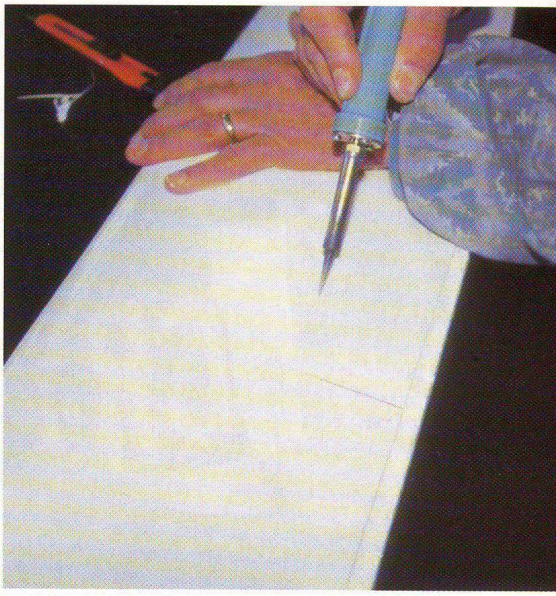
To cover the upper surface of the wing simply repeat the previous operation (steps 1 to 5). When covering the upper surface though trim the vinyl with a small excess of around 5 mm to form an overlap where the coverings join.

On the trailing edge you can trim the vinyl much tighter or, as at the leading edge, allow a greater margin and overlap the covering. Personally, I prefer to cut very tight and avoid a double layer of vinyl at the trailing edge. I then use the iron to ensure that the vinyl is well adhered on all edges.

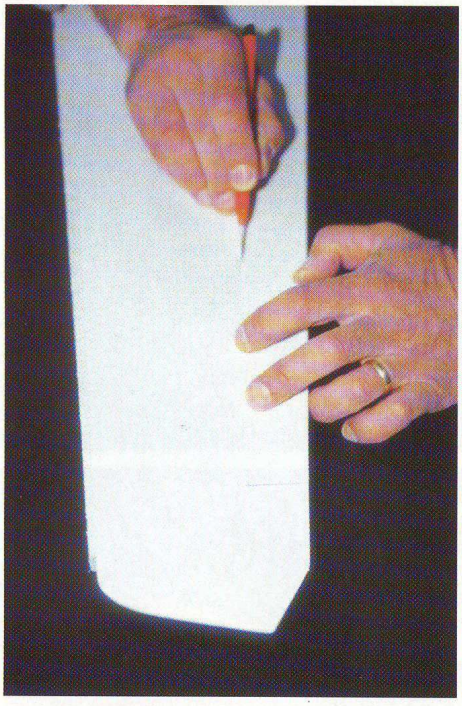
Finishing

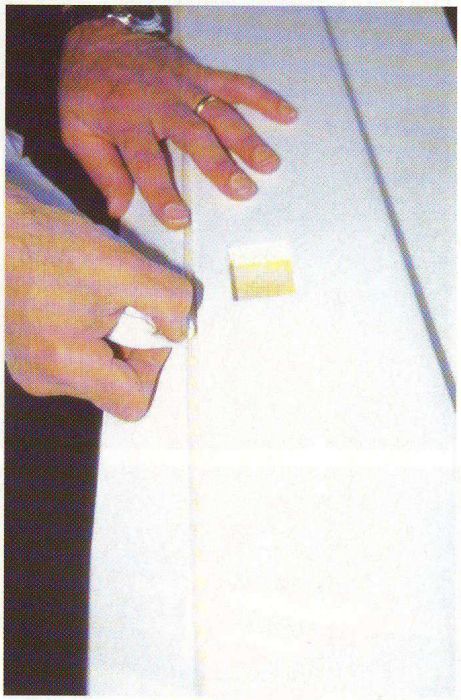
Depending on the building technique used you may have to cover the control surfaces separately and attach them with hinge tape.





Alternatively, if the control surfaces are 'living' hinged with nylon ribbon during the construction (as is often the case today), cut the vinyl at the hinge gaps and at each extremity. Then apply the tip of your soldering iron along the control surface slit whilst taking care to operate the control surface in order to widen the slit. Repeat the operation two or three times.





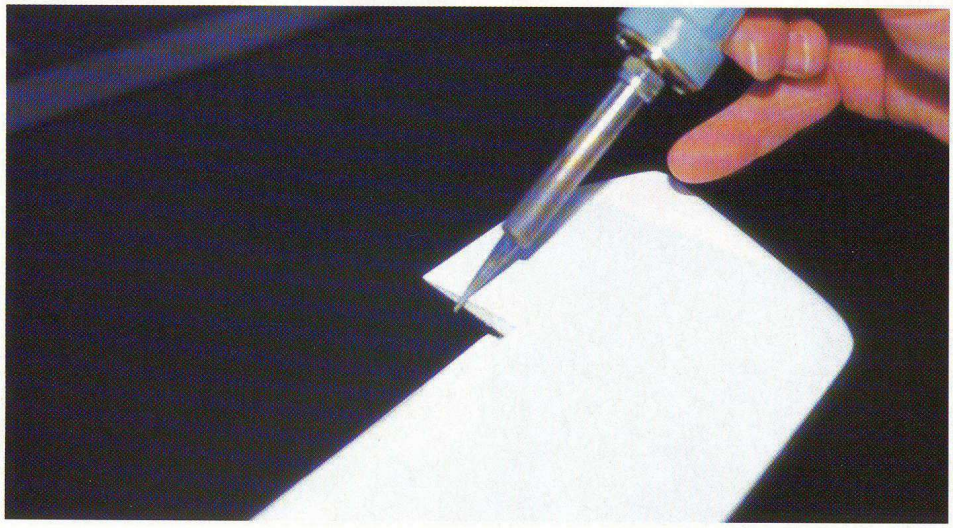
Decoration

You have finished covering your wings? Congratulations! You can now think about how to decorate them.

Easiest and quickest is simply hand cutting different coloured vinyl shapes to your required design.

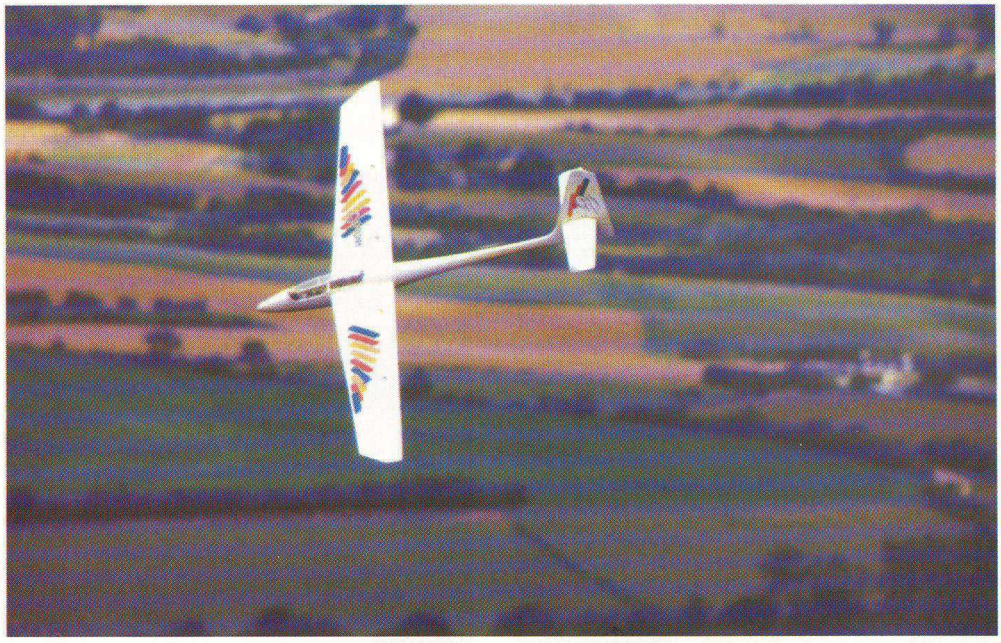
Another alternative is going digital and using CorelDraw interfaced with a cutting machine. The software allows you to digitise any drawing and then to pilot it to a cutting machine. Such cutting machines can be very expensive, although Roland has an interesting A3 format cutting machine for around £450. You could also try talking nicely to a local signwriter to try and strike a deal. The photographs show what is possible.

It is also possible to plot (with special inks) on the vinyl (before the covering of course!) and obtain incredible results. Unfortunately, this printing technology is not accessible to us yet and the price is still prohibitive.



Maintenance and Cleaning

You can use acetone, white spirit and other distillate without any problems. If you have to repair some damage on your wing a small vinyl patch will be fine and remains discreet. If you have to remove the covering altogether the use of a hairdryer will allow the vinyl to lift more easily, although further sandpapering will be necessary before covering again.



Conclusion

The vinyl is not perfect but with a little experience you will be able to cover in record time whilst still obtaining a very good finish on your wings. The surface quality obtained will easily surpass conventional covering materials and the skills and tools required are available to us all.