SCALE MATTERS: ARTCILE 5

SOPWITH PUP 1/3 Scale
Fabric and scale covering techniques.

By John Armarego

5rd Article featuring the Sopwith Pup **covering techniques** using Acetate fabric.

Insert Photo 1 and 2here
1/3 Scale Sopwith Pup flying over the NAAS valley in the Canberra ACT on Anzac day 2016.
2016 is the centenary of the first flight of a Sopwith Pup.
A prototype was completed in February 1916 and sent to Upavon for testing in late March.
In May 1916, the RNAS received its first Pups for operational trials with "A" Naval Squadron.

Scale Matters article 5, presents and explains the techniques I have developed to cover model aircraft in a scale and realistic way. These techniques will help you produce a scale and authentic finish on your model aircraft when the original aircraft war fabric covered. I have used my 1/3 scale Sopwith Pup as the example in this article. This aircraft was presented in my introductory article in a previous edition of Airborne.

FABRIC (Acetate)

Having your model covered in a realistic fabric covering adds a very effective overall look to the aircraft. There are many reasons why I chose to cover my (particular WW1 but also other classics subjects) aircraft in fabric covering:

- It is relatively easy once you master the techniques.
- The finished effect is outstanding:
    - The way the covering shrinks provided a more authentic effect,
    - It will not wrinkle or sag even in the most extreme heat,
    - It provides the same scale texture as cloth,
    - Additional scale detail is easily applied to the covering,
    - I have models over 15 years old that still look as good as the day they were finished, even better with a little bit of hangar rash.
- The covering is much cheaper than conventional covering material,
- The covering is easy to patch and repair if required.
- The covering can be painted with whatever colour your model requires.
- The finished product is strong and can be light if painted correctly.

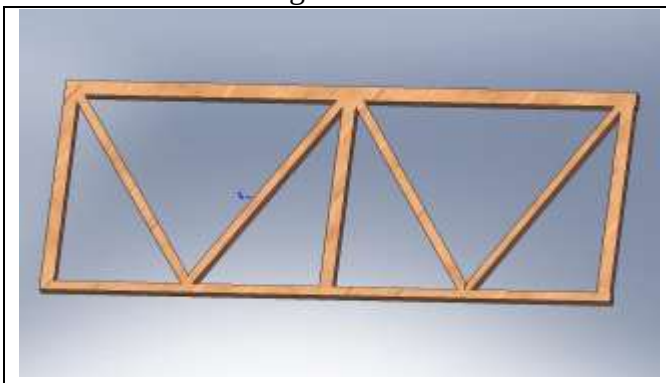
The material I use is 100% Acetate (artificial silk, man-made fibres) and this can be purchased from Spotlight or other haberdashery shops. The material can be purchased by the meter or by the role, the role is 1.22 meters wide and this extra width comes in handy for large aircraft. It is much cheaper when purchased by the role and it is always worth taking advantage of spotlights specials. Specials are the time to stock up, you may even be able to go halves with your wife or other club members.

Acetate is also refer to as BEMSILK, Bemsilk is 100% acetate fiber multifilament yarn plain weave fabric structure. It can also be referred to a Sunsilk which is a brand name.
Bemsilk or sunsilk also comes in many different colours, you can use the coloured material to help reduce the total amount of paint that you will need to cover the fabric with when spraying . For example if you are covering a Tiger Moth and want the final colour to be red, then if you use red coloured cloth you may only need to spay the covering with two light coats of red paint to get sufficient coverage.

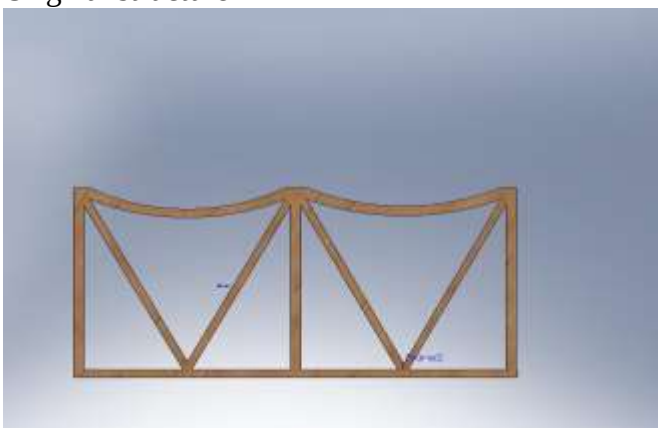
STEP 1

STRUCTURAL PREPARATION

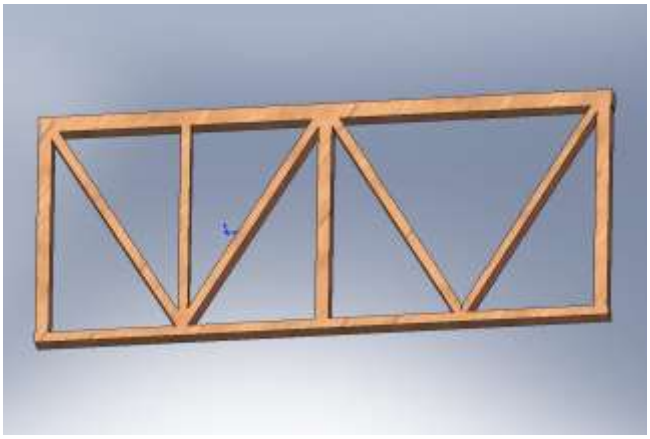
Check the suitability of the structure to be covered. The doping process can cause considerable shrinkage and distortion in different directions. Be warned, however this can work to your advantage if it is the effect you want. Inspect the piece to be covered and if you think the piece may suffer from the cloth shrinking then add additional bracing.



Insert Photo 3
Original structure



Insert Photo 4
Distortion that can occur once covered and doped due to the shrinking process.



Insert Photo 5 here

Note: addition piece added to prevent distortion.

Step 2

Surface PREPARATION

All pieces should be fully sanded to shape and then lightly sanded before attempting to start the covering process. For a really good finish, dope the areas to be covered and then once dry, sand the surfaces smooth with 600 grit paper. This step seals the wood structure to prevent it absorbing to much glue (keeps the weight down). This step also provides a strong key between the structure and the covering once the top coats of dope are applied.

Step 3

Cloth PREPARATION

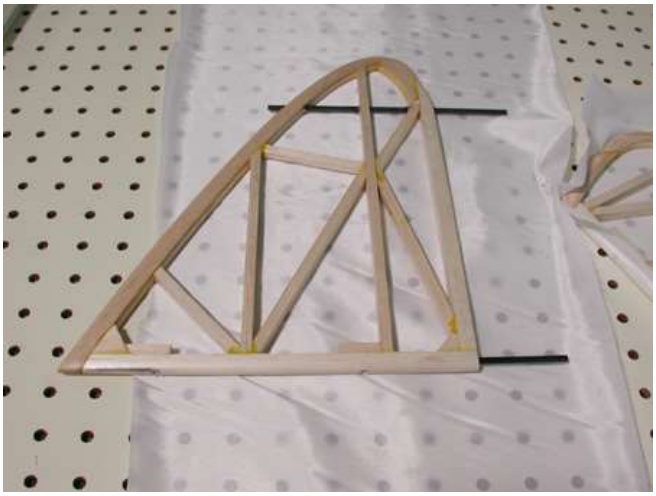
When storing the cloth, fold it gently or keep it on the role, this will prevent it getting creased and will keep the weave even. If the material gets creased it is harder to work with (You can iron the creases, but who likes ironing).

- Place the cloth flat on the bench,
- Place the part to be covered on top of the cloth,
- Mark the cloth area required for the part, I use a lead pencil,
- Always cut a larger area than is required, it can be trimmed later,
- Use sharp scissors or a straight edge and blade to cut the cloth.

Caution

- The cloth can ladder if it gets caught on sharp objects.
- Make sure that the texture in the cloth runs parallel to the structure. (Stretching is in the x-y plan).
- Only do one side at a time until you get proficient at it.
- When you get proficient you can do a full wrap from top surface to bottom surface.
- Always do each pair (elevators, ailerons, wings) exactly the same.

Insert Photo 6
Elevator ready to be covered in cloth



Insert Photo 7
Laying out the stabiliser ready to be covered.

Step 4
GLUE PREPARATION

Glue that works.

A range of glues will work but they need to provide the following properties:

- Sufficient time to allow you to work the material,
- Able to be thinned down with water,
- Provide sickness before setting, helps with working the material.

White wood glues are best, some examples are

- Selleys PVA,
- Weldbond,
- EFC Simply Glues.

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Insert Photo 8
Suitable wood glues

These wood glues that can be sanded are not as good in this application:

- Selleys Durabond (Great glue but not for this),
- Great Planes (Great glue but not for this),
- EFD Yella Tera (Great glue but not for this).

Insert Photo 9
Glues not suitable for this covering process.

STEP 5

Gluing

Pour an amount of glue into a bowl say 100ml. Water down the glue with about 30 - 50 percent water. You can keep adding water to your glue pot to prevent the glue setting. The glue can be used straight depending on how thick it is. Brush or finger on white wood glue along the outer surfaces of the piece to be covered. While the glue is still very sticky, the covering material can be placed over the frame to be covered.
The material can now be pulled in all directions to remove any slack, it does not have to be tight just pull out the slack in the cloth.

- If the glue is drying to fast you can rub watered down glue over the top of the outer edges to reactivate the glue back into the sticky state again.

- A spray bottle full of water can also be used to spray a mist over area that need more adjustment, this will give you more time to work the cloth.
- Another technique is to let the glue dry completely and then iron the covering down onto the structure while pulling it tight. (Aliphatic resin is heat sensitive and it works well like this if you get the right amount of glue on the structure.)

Insert Photo 10
Glue applied to wing tip

Insert Photo 11
Covering wrapped over glue

Insert Photo 12

Covering pulled to remove wrinkles

Edges ironed down on wing tip

Insert Photo 13

Insert Photo 14
Wing tip with cloth rolled over the edge.

Once the covering is held down without wrinkles it can be left to dry. A few wrinkles are ok, the main aim is to have the covering not tight, but flat.

Once the glue is dry you can go around the outside of the covering with watered down white wood glue using your finger to smooth the covering down and to ensure that it is not lifting in any places and that a full pond has been achieved.

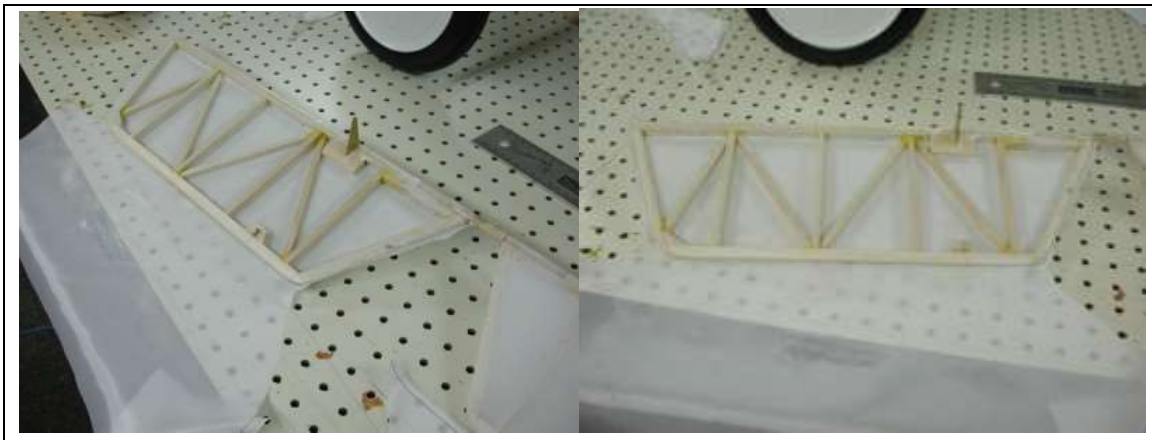
As this is drying, you can cover the other side using the additional glue applied in the step above. If you are not confident yet, let it dry completely before doing the other side.

Once you get proficient at this you can speed up the process by using a hot iron. I use a normal size household iron. Set the temperature up on the iron so that it activates the glue and makes it soft but not too hot to burn the glue. With a rolling action of the iron, you can force the cloth around the outer edges which pulls tension in the cloth and speeds up the drying of the glue.

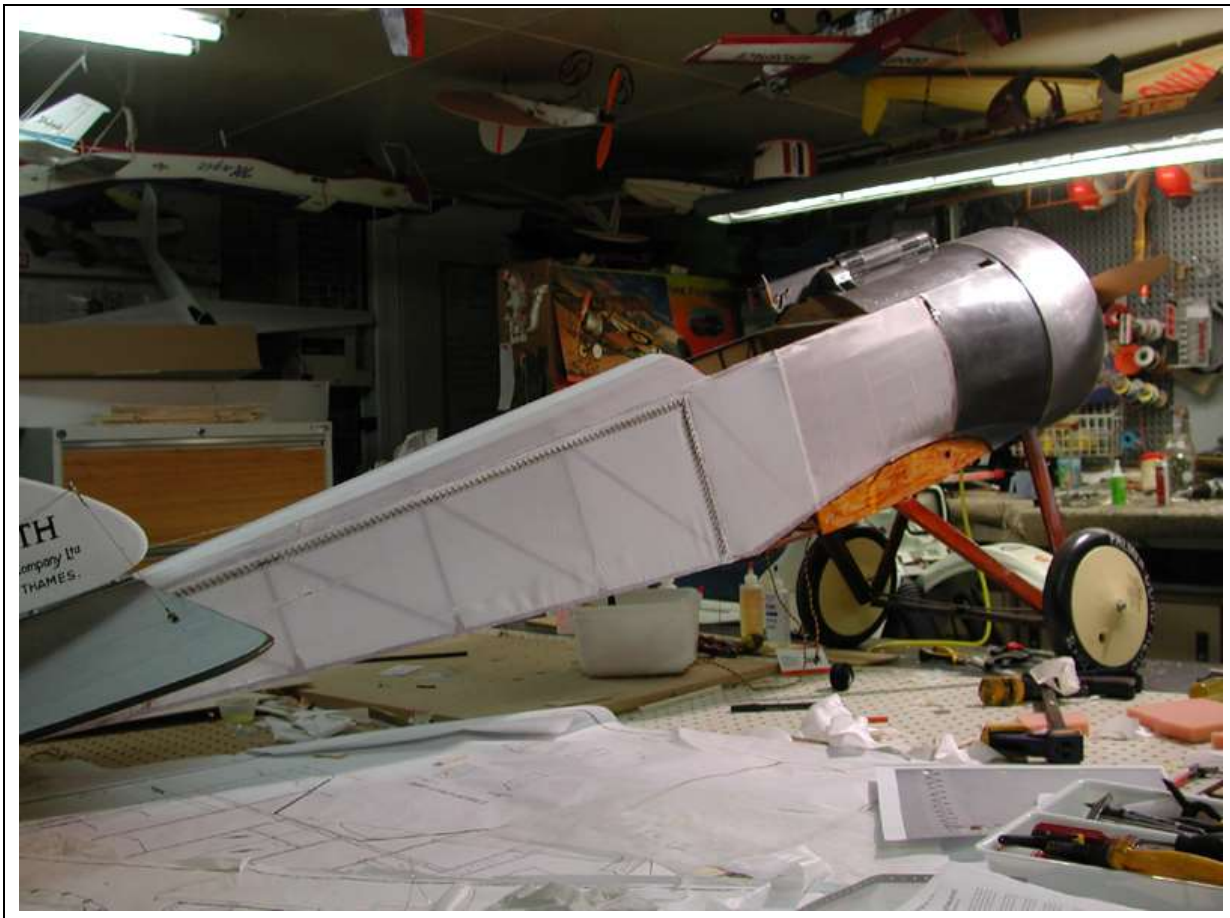
Any excess cloth can easily be trimmed with a sharp scapple blade. The excess cloth covered with wood glue once dried will not Frey as it is trimmed. Once the cloth is trimmed, applying the hot iron to the surface will stick it down nicely if it is lifting or if a protruding edge has formed. This works so nicely you will be presently pleased once you develop the technique.

Insert Photo 15 . Cloth glued to leading edge and ready to do the total wrap around.

Insert Photo 16



Insert Photo 17 and 18
Glue applied to elevator halves and covering being applied.



Insert Photo 19
Covering the fuselage in a similar way to the other parts.

Step 6
DOPING

I use Pacific Balsa or Model Engines, model Aircraft Dope. Both these products are 27% Acetone w/v and 38% Xylene w/v so they are much the same. I have tried thinning these products down but they work extremely well just as they are. Be warned if you thin these products down even with dope thinners they can be very aggressive on the acetate and you may end up with holes in the cloth.

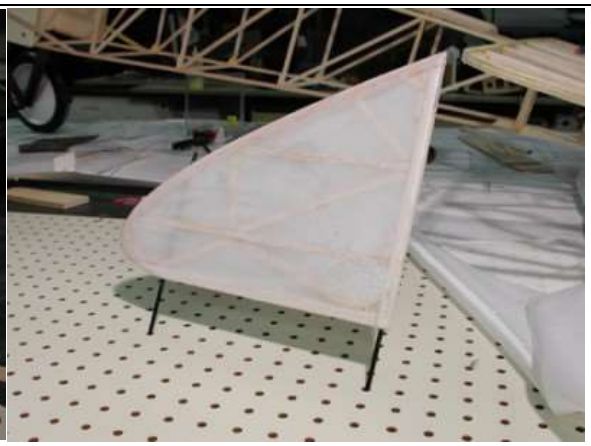
Apply dope liberally to each side that has been covered and particularly to where the cloth meets any structure such as the ribs. A wide 15 mm soft brush works well, wrap it in glad wrap if you are spending the day doping. To clean the brush at the end of the day use Acetone.

Dope both sides at the same time or it can induce warps into the structure. Brush the dope on pretty thick, but brush it on as evenly as possible. After the first coat you may think, what have I done it look terrible, but as it dries it will start to look really good, especially after the second coat.
Let each coat totally dry, usually overnight. Apply dope again to each side, until a total of three coats has been applied. Sometimes two coats is sufficient depending on the tension in the cloth when first applied, you can applied addition coats to some areas if they need additional shrinking.
The dope is used to shrink the cloth to remove any wrinkles and to seal the surface so that when you paint the covering it does not act like a sponge and soak up lots of paint (Heavy aircraft).

The overlap of material around the edges can be gently sanded between coats, but do not rub through, 1000 grit is fine for this stage. The pieces are now ready to add Scale detailing and or for painting.

Insert Photo 20
Elevators still wet from dope.


Insert Photo 21.22
First coat of dope on the wings, one wet one dry.

Insert Photo 23.24
Fully doped parts ready for scale detail before painting.

Adding Scale Detail

Full sized aircraft stitched the covering to the ribs to prevent the covering blowing off the whole surface if the covering became damaged. It was also used to ensure that the covering followed under cambered rib contours.
Once a model aircraft gets to this size, it does not look very realistic if the surfaces have no scale detail on them. The following method is not new, it has been used by modellers for a long time, this is my take on the method and the way I do it. This method makes a very time consuming process as fast as I think is possible.

On the Sopwith Pup there is over three and a half thousand stiches.
Theory is theory and practice is practice. The key is to understand the techniques and what is possible, and then learn to work the materials. What will work for some may not work for you?

Whenever seeking aeromodelling knowledge, talk to the guy that always has plenty of nice aircraft that he has built and also the guy that always fly's well, ask them what they find works. This hobby collects its fair share of Googleologists.
Get the knowledge and just get in and give it a go. When I first started developing these techniques I would ask other flyers if I could have their latest crash. I would practice covering, scale detail and painting techniques on their Brocken wing bits, I soon had way more wing panels to play with than I ever needed.

Background.
When the Royal flying core introduced rib stitching, the seine knots were pitched no more than 2" apart for scouts (Sopwith Pup) and 3" apart for training aircraft. The thread used is defined as "kite cord". Once the rig stitching is done, a 2" wide linen strip of cloth which has both edges frayed 1/4" is doped over the rib stitching.

The first thing to do is make the reusable board in which the nails are mounted in. The width of the board is not critical, the wider it is, the more rib stitching strips you will produce. The length should be longer than the cord or length of a wing rib. The nails are hammered in positon with the spacing between nails matching the required scale pitch between stiches. For a 1/3 scale Sopwith pup the stitching pitch is 1/3 x 2" = 17mm. Note the nails are hammed in with a rack back angle which helps keep the thread pressed against the acetate once the thread is woven around the nails.

Place a rectangular piece of acetate on the board that cover the area between the rows of nails. Tie the thread to the first nail and then thread the thread back and forth around each nail so that the thread is always parallel to the rectangular piece of acetate.

Insert Photo 25

Nails mounted in the wooden board at the scale spacing distance for the stiches. Note the nails are racked back.

I use Presencia No:8 thread from spotlight for the thread.

Insert Photo 26

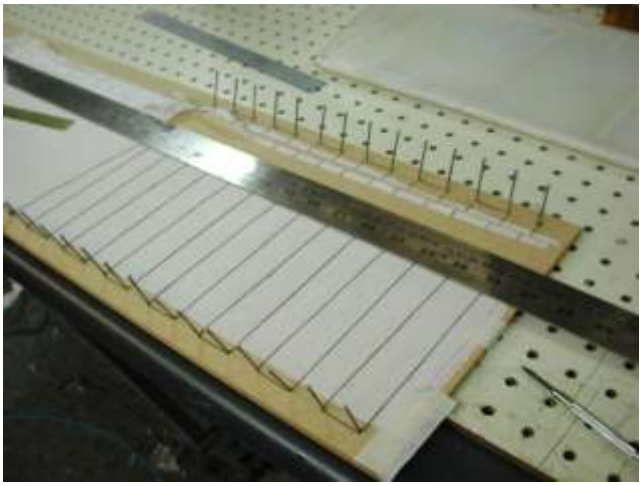
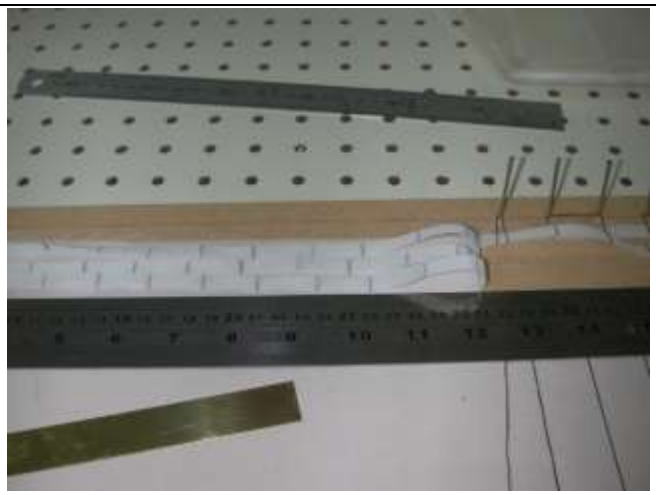
Presencia No:8 thread from spotlight.

The glue used here again are the same white wood (PVA) glues as used above. There is two way to glue the thread to the acetate. First method is wet the thread with glue by running it through your glue filled fingers as you thread the thread around each nail. The second method is once the thread is threaded around the nails and tied off, you can apply watered down PVA (50/50) with a brush to the thread an acetate. It's OK to use a fairly well loaded brush to make sure the thread is well covered. If necessary use two coats, just make sure that the thread is well bonded to the acetate.

Insert Photo 27

Gluing the thread to the acetate

Once the acetate and thread has fully dry, you can then cut the strips to the required width using a straight edge and a scapple blade. The width of the strip should correspond to the width of the rib.

Insert Photo 28,29
Strip being cut with the straight edge and scapple blade

Insert Photo 30
Strips ready to be laid onto the wing

The stich strips are then doped to the surface of the wing over the ribs and then over covered with another acetate strip. This over cover strip on the real aircraft was 2” wide and the edges were frayed both side by ¼” inch. This was the method used before the edges were "pinked" meaning the edges had little half-diamonds cut into the edge to assist adhesion. On the 1/3 scale Sopwith Pup the over strip is 17mm wide. To assist with laying down the strips on the covering you can apply a little PVA to both ends of the strip. Lock one end of the strip down using a hot iron and then stretch the strip along the rib and lock down the other end. You can then easily apply the dope.

Insert Photo 31

Centre top section with rib stitching completed.

Insert Photo 32
Finished wing detail note the stitching and the over cover strip

Scale Painting

In the next instalment of Scale Matter, I will be showing a few more covering detail techniques and then explaining the techniques I use to paint the covering material presented in this article.
If you have specific questions about any of the scale matters articles you can email me aeromodeller@outlook.com and I will do my best to answer any questions.

Until then happy building and plenty of flying.