

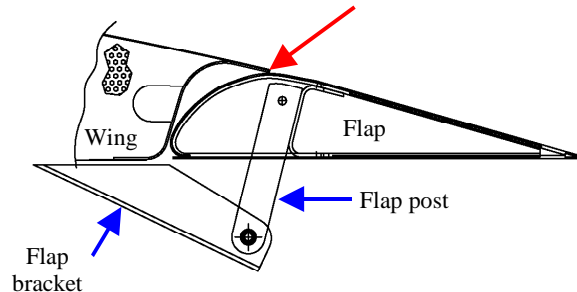
### Pre-Paint>Wings>Mount flaps

#### Objectives of this task:

In this task each flap will be positioned and the flap brackets will be glassed onto the wing.

The flaps are designed to stow in the flap recess at the rear of the wing with the front upper surface of the flap fitting snugly under the lip at the top of the flap recess as shown **arrowed** in the drawing at right.

In order to achieve an aerodynamic fit the top rear of the wing must be carefully prepared before the flap can be positioned and the flap brackets glassed into place.



Flap mounting is a **critical** issue that can affect the aerodynamic efficiency of the wing as well as general flight characteristics and considerable care must be taken with this task.

This is probably the single most important task in the Manual!

#### Materials required:

Card # J16 'Electric Flaps'

Glass fibre cloth bag labelled 'Hollow Wing', Epoxy resin and flock

#### Prepare the wing

Turn the wing upside down and pack under the trailing edge so that the wing is stable.



There are 4 squares of peel cloth under the gel coat at the trailing edge of the wing where the flap brackets will be located – carefully cut one corner then lift and remove the peel cloth from each area then lightly sand the area under the peel cloth.

The rear of the wing as supplied should be a uniform distance back from the rear of the flap recess. The photo at right shows the workshop tool that we use to check the depth and a line (in black, near the edge) that has just been marked.

If your wings have a black line like this marked along the rear of the underside of the wing then you should trim carefully to that line before starting on the next step.

Note that the wing is upside down in all photos in this task.



## Position the flap

The flap is positioned in 3 stages:



**Initial flap position:** lay 2 lengths of aluminium angle on the wing surface between the outer peel cloth squares and fix to the forward part of the wing with cloth tape as shown above.

Place the front of the flap onto the lip at the trailing edge of the wing and clip the trailing edge of the flap to the aluminium angle with spring clips (circled in yellow above).



**Lateral flap position:** the intention now is to position the flap so that the distance from the centreline of the wing mounting bolt holes to the first rib of the flap will be 12mm.

In the factory we use a method that entails measuring the distance from the centre of the wing mounting bolt hole to the outside of the wing mounting lug, then adding 12mm to that distance, which gives us the distance that the first rib of the flap must be from a ruler or straightedge held against the wing mounting lugs.

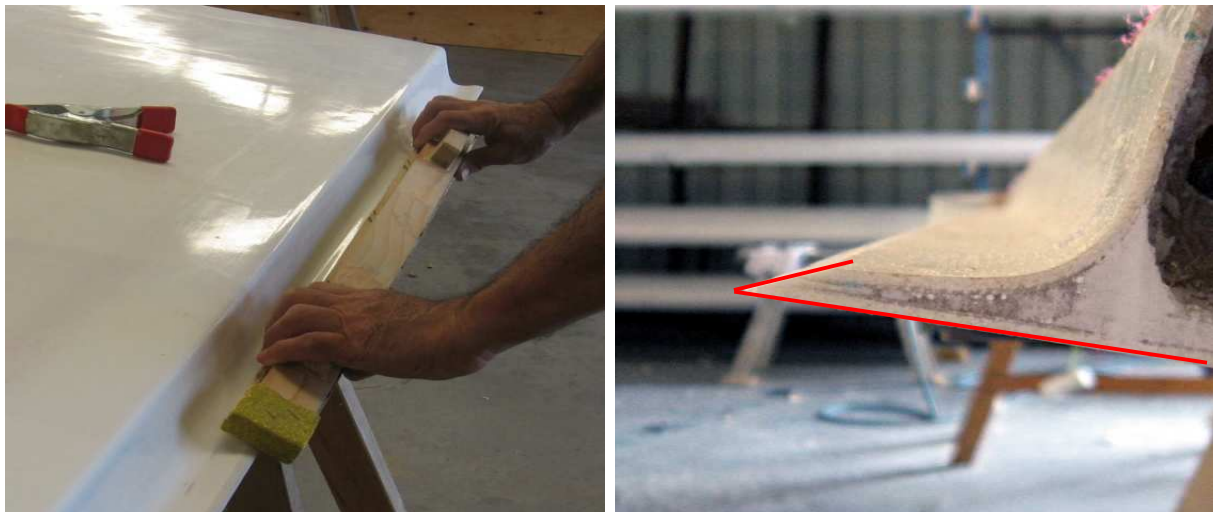
Move the flap gently until you are satisfied that the distance from the centreline of the wing mounting bolt hole to the first rib of the flap is exactly 12mm. When that position is correct mark the wing and the flap with 2 ruled lines fore and aft over the gap between the flap and the wing (use a marker pen) so that you can easily realign the flap to the wing.



**Flap to wing spacing:** tape 6 pairs of mixing sticks together. Place 1 pair into each end of the gap between the flap and the wing (green arrow above right) and 1 pair under the aluminium angle on each side of the flap to wing gap (blue arrows above right) to create the required curve to the underside of the wing as shown above left. Check that the flap is pushed forwards until the pairs of mixing sticks are being held firmly in place.

### **Match the flap to the wing**

Look under the wing at the point where the flap touches the trailing edge of the wing: the objective in this step is to fit the trailing edge of the wing to exactly match the flap, so mark the trailing edge of the wing where the flap touches and then carefully grind the trailing edge away until the flap sits snugly into the wing recess. Shaping should be done with a long sanding block: all shaping should be gentle in contour.



Leave the *rear* of the trailing edge of the wing straight and concentrate on shaping the *underside* of the lip (which is currently on top because the wing is upside down) on the trailing edge where the flap fits to an angle of approximately 30 degrees as shown above right (the angle has been emphasised with **red** lines in the photo) – this will allow the flap to retract and seat snugly under the lip with virtually no gap.

Shaping of the trailing edge will require several adjustments and each time the flap must be realigned onto the wing, using the marks that you made earlier, and the areas to be shaped are marked and then the flap is removed and the trailing edge of the wing is sanded to suit.

Take your time and get each flap *exactly* right: effort applied at this stage will be repaid in flying pleasure later.

When the angle shaping is finished use a straightedge to do a final check of the rear of the wing (which should be absolutely straight), while the angled underside of the trailing edge of the wing will be a precise match to the shape of the flap.



### Prepare to flock the flap brackets

Position the flap onto the wing again. Place some very thin spacers (paint thickness, or about 0.2mm) between the top of the flap and the lip at the rear of the trailing edge. Reset the lateral flap position and refit the mixing stick spacers as described at the top of the previous page. Be *very* particular about the flap positioning at this time because you are about to mount the flaps permanently, and once they are mounted it will be extremely difficult to make any changes without causing considerable damage!



Remove the peel cloth from the outside and the inside of the flap brackets. Lightly sand the inside and outside of each bracket.

Lightly sand the entire peel cloth area where each bracket will be mounted to ensure a good bond.

Using regular brown packing tape, gently tape over the gap between the flap and the wing as shown at right to prevent any flock from entering the gap. Take care not to move the flap in any direction!

Check that the mixer stick spacers are still correctly positioned.



Place a bush in each flap post and carefully sand off the sharp edges from the rounded end of each flap post (circled at right).

Cut the glass fibre cloth from the bag marked 'Hollow Wing' as marked – cut slightly outside the marked area.

There will be 3 pieces of glass fibre cloth for each flap bracket. Lay them on the wing in front of each flap bracket position.



Make a final check of the flap alignment and make any final adjustments that may be required: remember, this next step will be almost impossible to undo so be absolutely sure that the flap is correctly aligned before moving on to the next step.

## **Fit the flap brackets**

In this step the flap brackets will be flocked into place and then covered with 3 layers of glass fibre cloth. This all needs to be completed in the one continuous operation. In our factory this step takes over an hour with an experienced person, so allow perhaps 2 hours or more.



Mix a batch of resin and coat the inside of the flap brackets and the wing surface where the flap brackets will be attached. Mix a separate small firm batch of flock and fill the inside of the angled end of the flap brackets as shown above right.



Place each bracket: holding the bracket clear of the wing, insert the bolt through the bracket and the bush, then let the bracket rotate down to the wing. Do this for each bracket.

At this point recheck the marker pen mark across the wing and flap to be sure that nothing has moved.

Once all four brackets have been placed apply a gentle downward pressure to seat each one and then round off any excess flock around the base of each bracket to an even contour with the rounded end of a mixing stick. This rounded contour will help to avoid air bubbles when you apply the glass fibre cloth in the next step.



Working on one bracket at a time, wet an area around each bracket that is slightly wider than a piece of the glass fibre cloth that you cut out in the “*Prepare to flock the flap brackets*” step above, then place a piece of glass fibre cloth onto the bracket and brush it on, working down the sides of the bracket and onto the wing, taking care to brush out any air bubbles and paying particular attention to the curved flock joint between the bracket and the wing.

Repeat this process for each of the 3 layers.

Note that the first layer should be slightly ‘wetter’ than the following 2 layers.

The photos above show the second layer being applied.

There will be some excess cloth that will cover the brown packing tape – this will be cut off after the resin has cured.

Leave overnight to cure.



Next day heat the excess cloth along the wing-to-flap gap and cut it away carefully with a sharp knife.

Remove the brown packing tape and clean away any excess fibre and flock.

Remove the flap from the wing, taking care to save the pivot bushes and bolts, and store for later painting.

### Check the slot size

At this point you have mounted the flap to the wing with the flap upper surface correctly aligned in relation to the trailing edge of the wing. Now the slot size – the gap between the trailing edge of the wing and the leading edge of the flap – must be checked.

The slot size is very important – when the flap is extended the airflow through the slot provides control of the airflow velocity over the flap, and thus the slot or gap size must be identical along the width of the flap or there could be a rolling moment when the flaps are extended.

To check this, turn the wing right side up and fit the flap, taking care to fit the bush before each bolt.

Deflect each flap to as close to 39.5° as you can (it is more important that the angle be the same on each wing) and hold the flap in that position at each end with a strip of cloth tape.

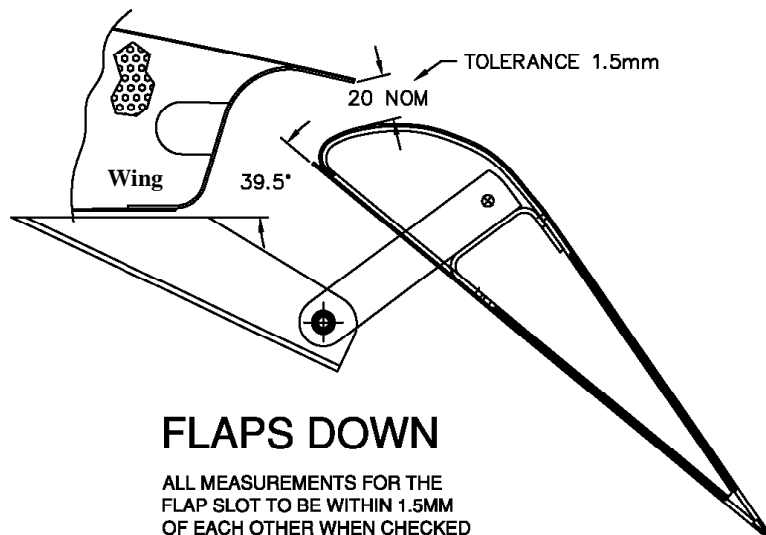
Now measure the slot size at each flap post as shown in the drawing at right: the slot size should be as shown, but the critical measurement is that the

slot size should be the *same* across the full width of the flap and the slot size should be the same for both wings at the same flap deflection.

If you have been careful in the initial flap alignment the slot size should fall within the acceptable tolerance range, but if you need to make adjustments then they should only be minor and these adjustments should be made with a long straight sanding block, starting by *slightly* altering the angled under-face of the trailing edge of the wing and *only if necessary* then altering the trailing edge of the wing itself.

Final adjustments will be made in the *Testing>Flight testing* task.

This completes the *Pre-Paint>Wings>Mount flaps* task.



### FLAPS DOWN

ALL MEASUREMENTS FOR THE FLAP SLOT TO BE WITHIN 1.5MM OF EACH OTHER WHEN CHECKED ABOVE EACH FLAP HANGER ON THE AIRCRAFT