

**Notes on Motor Glider wing rigging, fitting of airbrakes and changes to installation as well as expansion of installation.**

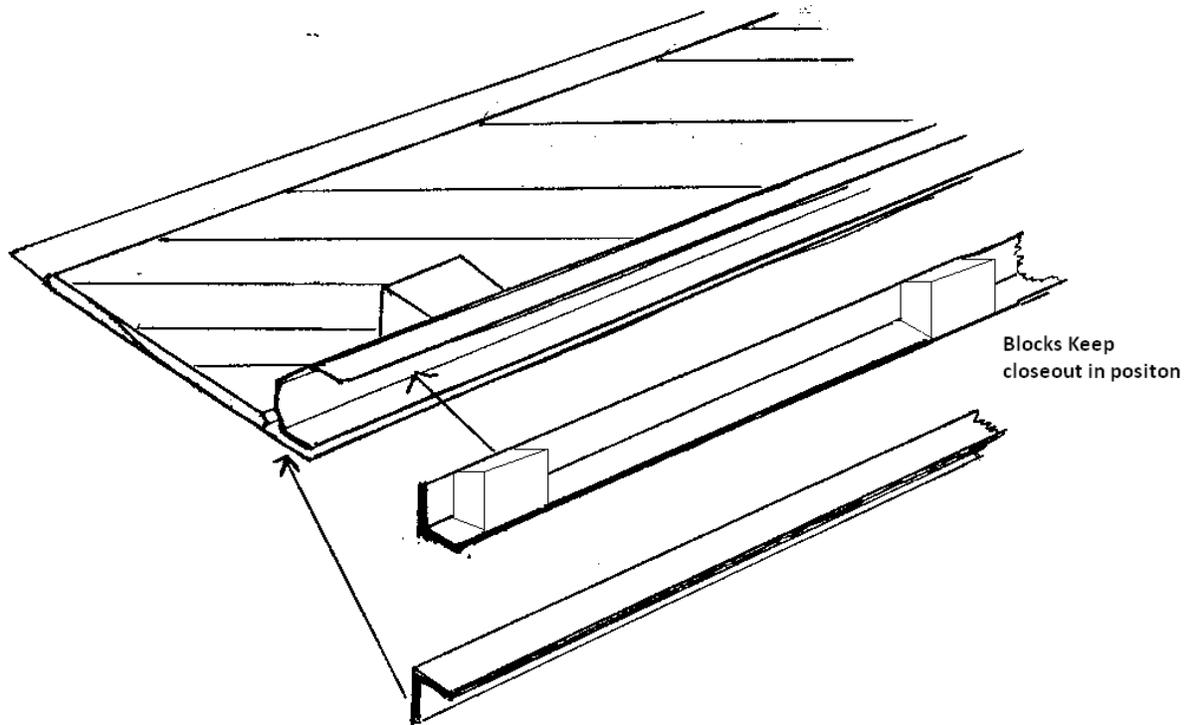
**By Bud Yerly**

**Change 1a**

Page 8-22 regarding the outer quarter to closeout bonding change to read:

To bond the closeout to the outer panel you will either need a 2.3m (7ft 6in) long bench and a piece of 25mm square steel angle section the same length, or two pieces of the angle section the same length or a piece of lumber made to fit the closeout. It is essential to note the thickness of the aileron at each weight box position as well as the ends to allow the aileron to fit after construction. Cut a piece of lumber to force the thin trailing edge material to fit the aileron contour.

The aim is to bond the 1/4 panel and the closeout trapped between two straight surfaces. Using Araldite 420 thickened with a little flox, bond the lower surface of the closeout to the trailing edge of the 1/4 panel with the angle section clamped gently in several places with the aft edge of each kept in line. The gap of the closeout is necessary to keep from flexing and reducing in the aft edge. Use suitable release materials. Allow to cure fully.



*Fig 24. Bonding 1/4 panel to closeout.*

When the aileron closeout 3/4 panel joint has fully cured, an additional layup is applied to the forward face of the closeout and on to the inner skin of the panel and mass balance boxes - see figure 25. Scuff sand all areas.

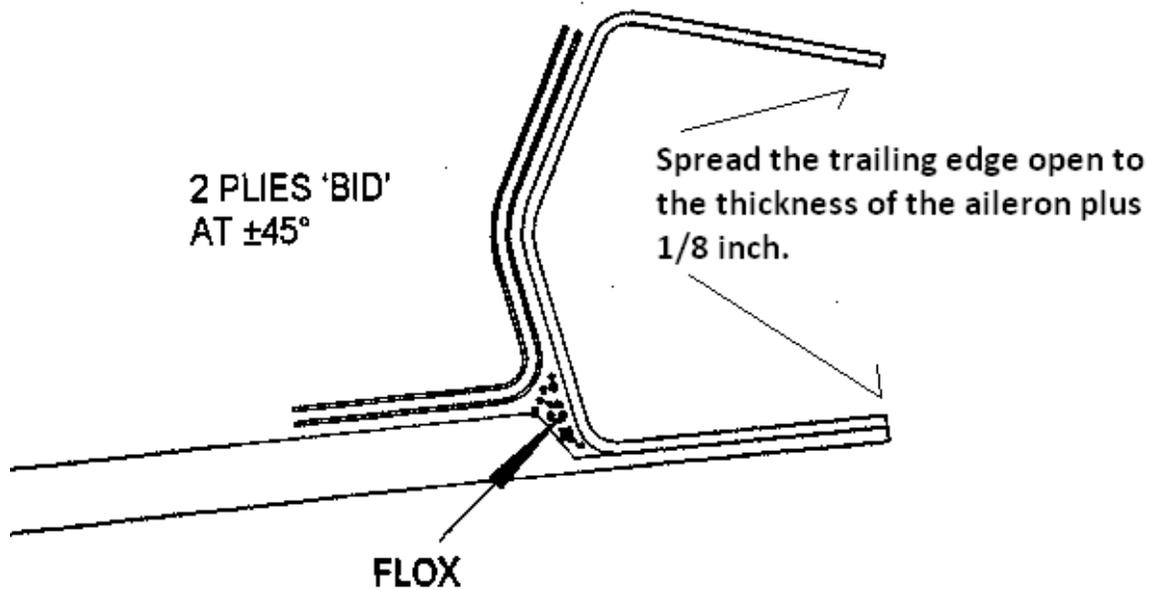


Fig 25. Layup on closeout and mass balance boxes.

Use a generous flox fillet in the corners, and apply two layers of 'bid' at  $\pm 45^\circ$  from the top of the closeout down and onto the inner skins and mass balance boxes. Peel ply in the areas of BL200 and BL249 for future bonding to the rear of the outboard ribs. Allow to cure.  
End of change.

### Change 1b

**Wing root fairings are not to be completed until all rigging of the ailerons, sweep, angles, airbrake and aileron pushrods and final checkout is complete.** This section of old pages 8-27 through 8-32 should be moved to the end of chapter 27a after finishing the wing build and rig. Page 8-27 through 8-32 of the Motor glider Manual remove and replace with new content below.

### New content to be added to page 9-5 of the Motor Glider Manual:

Aileron chord wise pushrod determination is the same as with the short wing:  
The length of the aileron chord wise pushrod is a matter of measure and fit.  
Using the knowledge gained from the short wing build for both the pushrod construction and aileron adjustment procedure (Pages 9T (or M)-3 and review these chapters and proceed to set the up stop limits at 25 degrees up and the down limit at 22 degrees. Final will be 23.5 and 20 respectively.

Airbrake pushrod and adjustments:

The length of the airbrake chord-wise pushrod is a matter of measure and fit also. Set the airbrake closed in its rebate and the bell crank to the closed position and note the distance. A stiff wire is an excellent tool for this. Then set the airbrake to 60 degrees and the bell crank to its stop and measure again. Use this coarse length to determine the actual ½ inch rod length. Note that with both MW-4 bearings and tube fittings attached the rod itself is about 3.5 inches short of the coarse measurement taken. Should the airbrake detent for the pushrod and bearing not have been molded correctly, this may require cutting the airbrake slot and re-glassing it back to get proper movement and clearance without binding of the pushrod to the airbrake.

### **Airbrake lateral pushrod length determination and final fit to fuselage:**

Finding the actual airbrake protrusion into the fuselage is not difficult but will require rigging and de-rigging a few times.

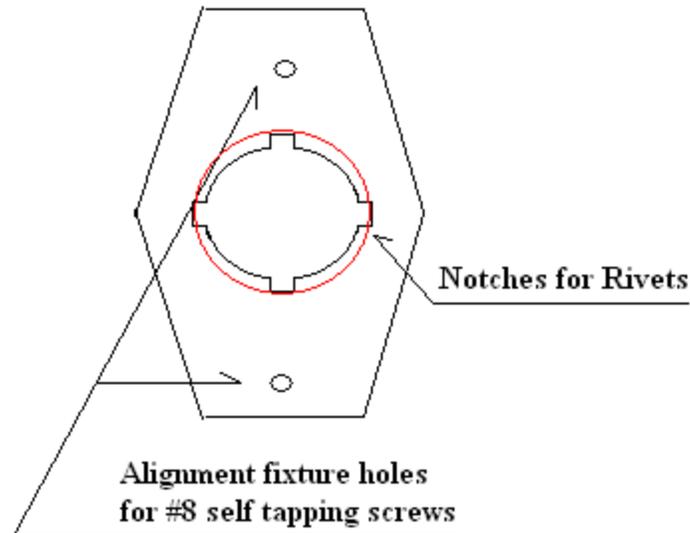
With the airbrake fuselage lever arm and push pull cables installed and the cable hold down fixture attached to the cable but not attached to the seatback, proceed as follows:

Wing first. Install the airbrake pushrod into the airbrake slot and attach to the bell crank. Do not attach fittings to the inboard position of the rod and leave it long at the 95 inch length which is about 6 inches too long for final fitting. Position the airbrake pushrod fore and aft up and down until it moves without rubbing. Note the position. If a rib or other glassing bit is rubbing and restricting the movement, apply sandpaper to the pushrod or similar tube and detach the pushrod from the bearing and clearance the hole using a sanding movement of the rod until satisfactory clearance is achieved. Normally 3-5 mm or 1/8 to 3/16 inches is sufficient. Remove sand paper from pushrod if used. Note that the pushrod should be roughly parallel to the wing spar and at a distance of about 1.5 inches on the port wing and 2.5 inches on the starboard from the spar.

Next slide the phenolic guide on to the pushrod. This phenolic guide aids in rigging and de-rigging as well as the fitting process. Clearance the phenolic until it slides on the tube easily. Position the diamond shape phenolic on the rib up and down and fore and aft until the movement is free and clear and the airbrake operates freely. Mark the position of the phenolic and remove. The pushrod was attached with the TLPD rivets and will not allow push rod removal for further work or future maintenance. Notch the phenolic as appropriate to allow the rivets which secure the pushrod end to pass through the phenolic for the fitting procedure. Make two small holes for temporary screw holes to hold the phenolic in place while fitting. A #8 drywall self tapping screw is ideal, as it holds the part secure enough for fitting, however two 1/8 inch drill bits work as well with a dab of 5 minute epoxy. Repeat on the other wing.

*Caution: On final install, should the airbrake check nut become loose, the airbrake rod could become jammed in the closed or partially opened position by the rivets impacting or jamming on the phenolic due to the now rotated push rod rivets being out of alignment with your slots. The phenolic is tight fit is to help in wing rig guiding of the airbrake tube. On final assembly, if in doubt, make the hole in the phenolic guide large enough to pass the rivets should the tube be rotated. Chamfer the edge of the inboard side of the phenolic to prevent the rivets from hanging up. This larger hole in the phenolic guide will require a larger hole also in the fuselage as the airbrake pushrod will obviously have more slop and could hang up or excessively slow the rigging process. Make the hole in the fuselage as small as possible because this is a structural area of the fuselage. Whatever you do, do not cut into the bulkhead.*

## Phenolic Guides Detail



**Note:**  
Final assembly may require the builder to relieve or remove the notches to allow rotating the pushrod for adjustment. Normally once installed the pushrod is locked in alignment and the clevis fork adjusted for proper length.

You have now determined the position of the pushrod and it is time to cut a hole in the side of the fuselage to fit the pushrod.

### Method one:

Remove the pushrod from the wing but leave the phenolic. Using a scrap piece of tubing, install it into the phenolic and rig the wing to the fuselage. Once the wing is rigged, move the tube scrap to the fuselage side and mark roughly. Remove the wing and make a hole as marked. Should you have placed the fillet on early, this is very difficult and you may find it necessary to cut the fillet to see or use fast setting glue to temporarily attach the tube to the fuselage. Normally the task can be accomplished by just fitting the wing near the fuselage and align the pins until nearly engaged with the dihedral at 2.4 degrees and marking the fuselage.

### Method two:

An alternative method is to trim the pushrod so as with the pushrod fully inboard, the end of the rod just touches the fuselage side when partially rigged. That is push the wing into the sockets only about ¼ inch at the proper dihedral angle and then mark the tube. We have found this to be quite fast and marking is done by rotating the tube on the side of the fuselage to make quick work of the hole marking.

Once the hole is marked, make the hole in the fuselage side. It is best to make the hole slightly larger for ease of rigging and de-rigging. Normally a ¼ all around is about right making the one inch tube have a 1.5 inch hole to enter when rigging the wings. The hole should allow the pushrod to enter the fuselage, and be approximately ½ inch or 12mm beneath the wing pins.

Once the holes are made and with the wings rigged and working acceptably when moved by hand, note that the cable pushrod elevation and outboard position is easy to fit at this time as is the pushrod length. Proceed to Chapter 28a.

### **Change 1c**

**Refer to Page 28a-7 and Add the following prior to “Cable Installation”:**

Rig the wings to the fuselage and pin fully. Rig the airbrakes fully closed, then move the airbrake handle to the fully closed and locked position and insert the rod end fitting into the pushrod with its pin fitting attached and mark the best position for the airbrake cable supports and install. Then fine tune the pushrod length to cable eye to get the airbrake position correct. Note the approximate position in figure 10. Mark the pushrod tube for cutting.

Cut the tube and install with rivets provided. Note there is the possibility due to builder variations that the pushrod will not go into the wing far enough at full extension, or be removable from the wing unless the phenolic is notched to provide for rivet clearance. Notch the phenolic as appropriate to allow for the pushrod to move freely and lock the adjustment nuts to prevent rotation. Once airbrake movement is working freely, proceed with airbrake and aileron final adjustments.

Set the GAB12 Cable Brackets for proper alignment so the cable is parallel and aligned with the airbrake pushrod. Mark and bolt as indicated in figure 11.

### **Starboard cable**

**Remains the same except add to the end:**

The starboard airbrake mechanism is the mirror image of the port. Check that the airbrakes are both fully closed, and the airbrake handle is fully closed and locked in position. Insert the rod end fitting into the starboard pushrod with its pin fitting attached, and mark the best position for the airbrake cable supports and install. Set the GAB12 Cable Brackets for proper alignment so the cable is parallel and aligned with the airbrake pushrod. Then fine tune the pushrod length to cable eye to get the airbrake position correct. Mark the pushrod tube for cutting.

Cut the tube and install with rivets provided. Note there is the possibility due to builder variations that the pushrod will not go into the wing far enough at full extension, or be removable from the wing unless the phenolic is notched to provide for rivet clearance. Notch the phenolic as appropriate to allow for the pushrod to move freely and lock the adjustment nuts to prevent rotation. Once airbrake movement is working freely, proceed with airbrake and aileron final adjustments.

Mark and bolt as indicated in figure 11.

Rig the airbrakes fully closed, then move the airbrake handle to the fully closed and locked position and insert the fitting into the pushrod with its pin fitting and mark the best position for the airbrake cable supports and install. Then fine tune the pushrod length to cable eye to get the airbrake position correct. Note the approximate position in figure 10. Mark the pushrod tube for cutting.

Cut the tube and install with rivets provided. Note there is the possibility due to builder variations that the pushrod will not go into the wing far enough at full extension, or be removable from the wing unless the phenolic is notched to provide for rivet clearance. Notch the phenolic as appropriate to allow for the pushrod to move freely and lock the adjustment nuts to prevent rotation. Once airbrake movement is working freely, proceed with airbrake and aileron final adjustments.

### **Setting the airbrake limits:**

The mechanical limit for the airbrake closed position should be the airbrake sitting in its rebate fully streamlined. However note that the lateral (span wise) rod end bearing does not contacting the chord-wise push rod. Normally they clear one another by about 1/8 inch. The open limit is obviously the stop on the bell crank. The airframe limit for the airbrake is the airbrake fit and hinging itself. Obviously you can't fit an airbrake mechanism unless the airbrake fits the rebate flawlessly. If it doesn't, grind, cut and rebuild as appropriate.

The airbrake once fitted and rigged may no longer achieve a full 60 degrees of extension. The normal reason for not being able to achieve even 57 degrees is the placement of the brackets on the airbrake, the stop size, and or the clearances in the wing for the airbrake bell crank. If the 1/2 inch pushrod impacts the top skin, do not cut the upper skin.

The initial setup is to set the airbrake to 60 degrees and the bell crank to the stop and measure the rod length using a stiff wire to measure center to center or rod end to rod end. Once calculated build the push rod with threading allowance for stop nuts and future trimming, then install. At this time check the clearance of the wing holes and bell crank metal supports as required to get the airbrake to close properly with the rod attached in final position.

Once the plane is rigged, the angle of the GAB 04 torque tube (which determines the throw length somewhat) can affect your airbrake throw due to handle length, position, mono wheel clearances etc. Again, adjust to fit and clearance as required to attain as close to 60 degrees of airbrake throw as possible. Nominally the throw should be 55-60 degrees for trouble free proper airbrake operation.

Once the wing is properly fit, sweep angle set, flap tube is clearance and the aileron and airbrake mechanisms installed final proceed with the installation of the wing fillets.

### **Change1d**

Insert contents of old pages 8-27-32 at the end of the section above:

### **Wing root fairings**

The wing root fairings come to you as pre-molded items. The outside surface will need washing with hot water/detergent to remove any trace of mould release agent.

*Fig 30. Flox fillet on lower skin.*

The wings will need to be rigged onto the fuselage, and the BLRS411N pip pins installed.

Onto the fuselage, around the wing you will need to tape on a card or similar shim approximately

2mm (0.080") thick where the fairing will make contact with the fuselage. This is to allow for a layer of 'bid' which will later be applied to the fairing and for the finish paint, etc.

Mark a span wise line on the upper wing skin in line with the rear pin, and mark a reference dimension along this line – about 300mm (12") outboard of the pip pin hole in the drag pin. This will allow you to locate the whereabouts of the pip pin when you lose sight of it under the fairing! The fairing should be slipped on to the wing from the leading edge by opening up the trailing edge of the fairing and springing it over. The inboard trailing edge of the wing may need trimming to allow the top and bottom surfaces of the fairing to make contact again, when the fairing is pushed gently up against the fuselage.

When you are happy with the fit of the fairing onto the wing, it needs temporarily attaching to the wing. Make a note of where the spar is inside the wing. You will be using 4 clecos through the fairing into the wing on both the upper and lower surfaces, keeping away from the spar, and working from the front towards the rear, and about 12mm (1/2") from the edges.

Use adhesive tape along the trailing edge cut to hold the two halves together. The join should line up with the trailing edge of the wing. Mark onto the wing skin where the outboard end of the fairing finishes, and remove the fairings.

Scuff sand on the wing from this line inboard where the fairing makes contact, and scuff sand the inside of the fairing in the contact area. Also scuff a 50mm (2") wide area on the trailing edge surfaces of the wing and inside the rear of the fairing. Scuff sanding on the gel-coated areas of the wings needs only to be enough to remove the shine from the surface; it is not necessary to expose the fibers of the structure. Scuff sanding of the 'bid' layup of the fairing needs to remove the shine and just cut into the fibers. Remove all traces of dust from the surfaces. Araldite 420 is used as the bonding agent. Thicken with flox to the "just doesn't run" consistency that you have by now got used to, and apply an even coat to the wing skin in the area to be bonded.

Spring the fairing over the wing without wiping too much adhesive from the wing skin, and install the clecos, lightly greased, from the leading edge, in the same sequence as the holes were drilled. Tape the trailing edge together at the join. You may find it helpful to temporarily tape the fairing to the fuselage to help the fairing to keep its shape, and also tape around the joint to the wing after removing any excess adhesive. Allow to cure fully.

Using the line that you marked on to the wing skin, locate position of the pip pin in the rear socket, and drill into the fairing, first with a small pilot hole, and then with progressively larger drills / hole saws, up to 30mm (1 3/16"), taking the opportunity to centre the hole over the pip pin if the original pilot hole was slightly off.

The fairing at this stage is still quite flexible at the area of contact with the fuselage, and will need temporary stiffening before the wings are removed. Using mixing sticks or similar small pieces of wood, you will need to "shore up" the outer edge of the fairing down onto the wing, with small blobs of 'bondo' or similar auto body paste. Position as required to ensure that the fairing will lie flat against the fuselage. Every 150mm (6") will be enough. Remove the pip pins and de-rig the wings.

Two plies of 'bid' now need to be laid up in the trailing edge area to join the fairing to the wing skin. This is the area you scuff sanded earlier. The cavity between the wing skin and the inside of the fairing needs to be filled with scrap blue foam. Cut the foam to the best shape you can, and glue it into place with dryish micro. When cured sand the foam back to achieve a gentle transition from the edge of the fairing onto the flange of the wing skin.

Scuff sand the inside face of the fairing and the under surface of the root rib, putting a small radius on the corner of the rib flange, and lay up a single ply of 'bid' at 45° over the entire fairing surface.

Congratulations, you are ready to finish the wing.

Notes on finishing:

The ailerons are quite large and require attention in the build of the counterweights as well as the filling and sanding to prevent binding, excessive trailing edge weight and achieve proper finished balance. Use the minimum amount of filler and follow the contour rather than just filling the top and bottom flat adding weight and drag. Use as little paint as possible.

Use special caution on the airbrake forward lower surface. You have worked hard to get the airbrake to fit, so don't overfill at this point. Pay attention to the leading edge shape of the airbrake. Airbrake flutter can occur if the leading edge of the airbrake top has a rounded edge. Note that flutter may still occur just as the airbrake is opened and closed. If this happens, call Europa technical support.