

# ***Evolan***

The Evolan tailless design slope soarer offers an all-round flying capability responding to a wide range of wind conditions. I hope you will be happy with your new model and I offer you some suggested assembly instructions based on the assembly of the prototype models. Please familiarise yourself with these instruction before you start you build.

The kit comprise of the following items:

Epoxy glassed foam wing, the Elevons have already been cut with preformed / hidden hinges.

Epoxy glass fuselage.

Accessory pack:

Wing dowel and tube

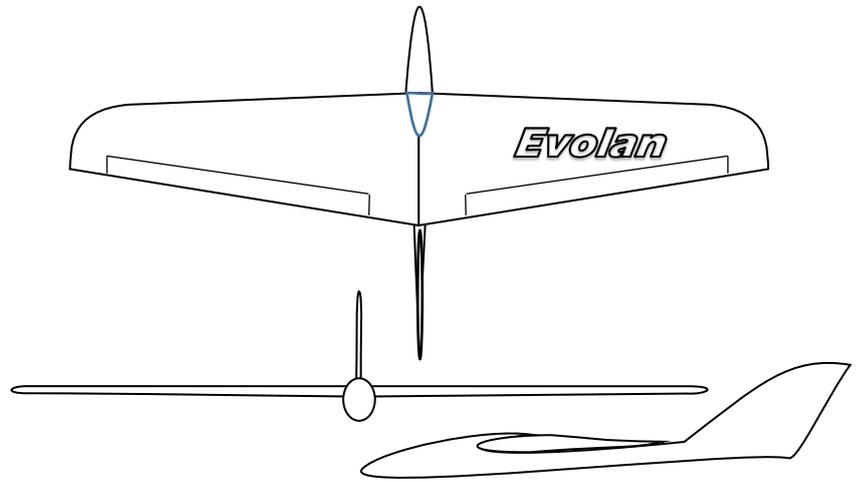
Servo recess cups and covers

Control exit fairings

Control horns

Servo mounts – 4mm ply

Servo cover reinforcement (1.5mm ply)



## **WING:**

I suggest that the Transmitter function for your Evolan model is set up for 2 servo Elevon (Flying Wing) controls. This allows for both controls to move together in the same direction for pitch control (elevator) and move in the opposite direction for roll control (Aileron). This will make setting up the position and movement of the servos easier.

The servos are installed from the underside of the wing.

The servo wire conduit has already been cut between the hole in the centre of the wing to the pre-cut servo bays.

The plastic cups sit in the servo holes and will need to be glued (Epoxy) into place.

You will need to decide how you want your servos will be positioned and fixed into place. The prototype uses the ply servo mount (provided) glued into the bottom of the plastic cup, which will keep the servo aligned correctly.

The servo is then secured using a small amount of epoxy glue.

However, before you glue the mount or servo into place you will need to align the servo correctly.

The method that works really well, keeping the control linkage mainly in the wing is to have the servo head / Arm outermost on the wing. This will position the control horn further along the Elevon giving better control authority.

Having positioned your servo, stick masking taper onto your wing between the servo hole and hinge line and then draw a line at right angles to the hinge line to the servo bay to align with the control arm of the servo.

The control link will need to pass through the wing diagonally from the top of the servo arm (level with the bottom wing surface) and exit approx 20mm in front of the Elevon control horn on the top surface (See diagram).

The hole through which the linkage passes can be made using a hot piece of piano wire, but care will be needed not to burn yourself and also to ensure you do not remove too much foam - Just enough to allow a 2mm rod to pass through allowing for free rotary movement of servo arm and control horn without snagging also consider the control clevises at each end.

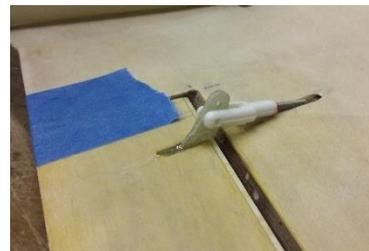
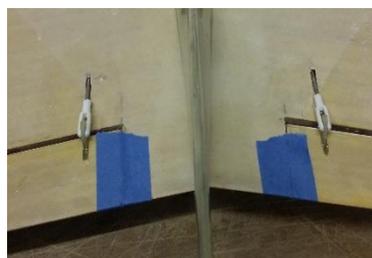
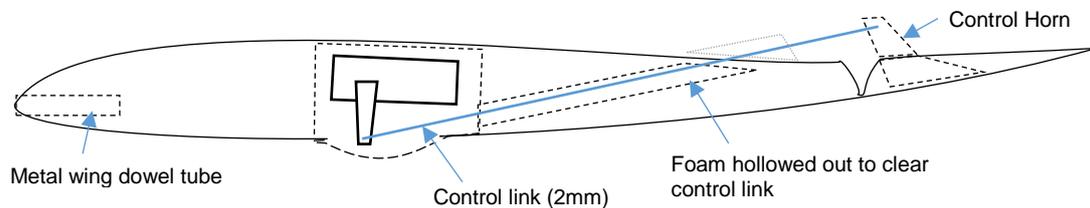
The servo cover has a bulge to allow for the servo linkage to be at the surface of the wing or even partly protruding above the surface.

**Servo linkage:** a 2mm partially threaded rod works well for the control link. On the threaded end I use a plastic clevis and at the servo end I solder a metal clevis.

Stick masking tape on the wing at the point of exit and mark the length of hole required to allow free movement of the chosen control link and clevis. Mark and cut the exit hole in the wing. A small 1.5mm drill and file or rotary tool, to create an elongated hole to suit your linkage.

In the kit you will also have a couple of fairing that will sit on top of the hole to make this more streamline, but these are added once the all the build has been completed before or after painting.

Also drill and file a slot into the top of the Elevon to accept the glass control horn ensure that both horns are the same height on installation. Glue these in place with epoxy.



### Attaching the wing to the Fuselage.

The prototype models both used a Leading edge dowel and a 5mm Nylon wing bolts to fix the wing into place. If two wing bolts are preferred then there is enough of a wing seat front and rear to allow for this. Suggest using 5mm captive nuts and plastic / nylon wing bolts.

If the leading edge dowel is preferred then the Brass/Alu tube is set into the centre of the leading edge with epoxy glue. This allows for the wood dowel to be replace easily if broken during a heavy landing. A corresponding hole also needs to be made in the fuselage to accept the wing dowel, but please ensure this is the correct size and aligned perfectly to maintain the position of the wing. This will also allow the access hole in the top of the fuselage seat to make access to the Rx and battery easier.

### Servo Cover:

The servo covers benefit from some reinforcement and the following what I do on all my servo covers including the ones that I attached the servos to directly.

1. Trim the cover using a cutting wheel trimming to a constant depth all the way round.
2. Ensure that the wood fits correctly aligning with the conduit or bubble in the plastic cover.
3. Remove the wooden disc and abrade the inside surface of the cover. (use dry – 600 grade paper or a fibre glass pen.
4. Cut some lightweight glass cloth ( 45g / 80g) to sandwich between the wood disc and the inside of the cover.
5. Wet out with epoxy resin and assemble in a cover glass wood sandwich ensuring that the holes / conduit align. Weight the wood down in the cover over night until set.



- Once the Epoxy is cured, trim excess glass cloth and plastic and. For the Evolan, The servo sits in the servo bay and the cover just hides everything. Inside the wing. On other models, a servo can be attached to the cover and on either case, the covers readily accept 3 or 4 countersunk screws to attach to wooden posts glued inside the servo bay.

Please ensure that the covers do not interfere with the servo control.

### **Fuselage.**

There is not much to do with the fuselage on the Evolan. The wing needs mounting and suggest the captive nuts for the wing bolt are embedded into 4mm ply and slid into place inside the fuselage to align with the hole and the wing bolt and glued into place. Before drilling and gluing, please ensure that the wing sits symmetrically on the fuselage. This can be achieved by measuring from each wing tip to the trailing edge of the fin.

Once the wing attachment is complete, the fuselage and wing can be prepared for painting.

### **Finishing the model:**

Any slight imperfections / marks - dinks in the wing surface may need to be filled (Ronseal 2 part filler) before the wing surface is prepared for painting.

I prepare for painting with wet and dry paper 800 / 1000 grade and fill any blemishes with Ronseal 2 part wood filler and smooth back with wet n dry. Make sure surface is free from grease/ dust.

Car acrylic aerosol or Jap Lac enamel paints have been used successfully in painting my models. But the process of painting is enhance by warming the paint before spraying. I let the tins soak in hot water to heat them up. This allows for the paint to dry quicker.

Chose a good primer or filler primer. Spray evenly just enough to provide an opaque covering. Rub down and reapply if necessary to get a good base coat.

Mask with good quality tape to apply finishing colour scheme. Starting with the lighter colour. Again just enough to get a good finish but not too thick.

I personally like to then apply lacquer but this a personal preference to achieve a higher gloss finish but is not absolutely necessary.

If using lacquer, I use 2000 grade wet - Wet n dry and very lightly go over the raised mask lines just enough to flatten paint line but not rub line away. If you rub too much you'll have to mask and lightly re spray.

Then a couple of light application of spray lacquer. Again ensure that lacquer tin is heated as above to apply hot and keep the coats light.

Dont be tempted to apply too much at once. Great initial finish but wait for the crazing.....

Once fully cured at least overnight in a warm room this can then be cut back with a good finishing paste/ polish.

My flying buddy just paints his models with Jap Lac enamel spray paints and doesn't use lacquer. To note, he has never had any paint crazing issues. However, that said, neither have I, if I haven't used lacquer.

Once the model is painted then the final radio gear installation is required.

### **Radio Gear Final installation:**

Fit the wing servos and ensure correct and free operation prior to gluing into place. The servo covers can be fastened flush with the bottom wing surface by fitting small wooden posts into the recess and then screw through the cover into the posts. Please ensure that these do not interfere with the servo control. See photo above.

The Battery and receiver should be placed inside the nose of the fuselage. Their position dictated by the balance of the model. However, nose weight will probably be required to achieve the correct balance. A suitable switch will also need to be fitted.

### **Balancing: C of G:**

Tailless aircraft are particularly sensitive to the position of Centre of Gravity (CofG). This is more critical than on a conventional (wing and tail) aircraft design, the more rearward the CofG the more sensitive the pitch control will be. Conversely, a more forward CofG position will require more up elevator trim to maintain level flight and more control movement required to control the model.

You will note that the CofG is much further forward on a Tailless design than on a conventional model, but it will still be quite sensitive to control. The correct position for your Evolan model Evolan will result in the trailing edge of the wing aligning correctly with the un-hinged part of the wing. Approx 3mm from a straight edge placed on the bottom of the main part of the wing; this is know as "Relfex" and is necessary for a flying wing design.

Also, a max elevator (Pitch) movement of only ~4mm is required. Any more movement, will result in pilot induce pitch oscillations due to over control. But I would suggest the use of rate switches to provide a little more than +/- 4mm (+/-6mm) if required until the correct CofG is achieved and the desired control response.

The CofG starting position should be 45mm measured from the leading edge of the wing at the root. DO NOT go any further back than 50mm otherwise over control is very likely and which could result in a crashed model.

You may also note that as the model is flow at greater speeds it may pull out of the dive slightly, this is due to the optimum reflex of the trailing edge. In higher wind speed where the model will be flying at greater airspeeds, this may require a **small** adjustment on pitch trim to achieve a hands off level flight characteristic. But the more you fly the model the more familiar you will be with this requirement. (Remember it is sensitive to pitch input).

Roll control is spritely given the suggested max Aileron control movement. Again for normal flight I generally use rate switches to tone down the response giving a very smooth response, I also dial in some exponential into the mixing (Desensitised control around neutral position). Only when I want to push the model hard do I select extra Aileron movement, or if I want to create a spin. However, if you want to spin the model, with extreme control movement,

the model will initially enter into a fast spin and then slow to a sycamore leaf type slow spin which will take an extra turn or so to exit on release of the controls. All great fun of course if you exit with enough height above the ground.

### Vinyl sticker application:

Transfer of the vinyl sticker image to your model is easy.

1. Using transfer tape or reduced sticky masking tape (this can be achieved by dabbing the masking tape with a dry cloth to reduce the stickiness of the tape).
2. Place over the vinyl sticker and rub the tape down onto the actual vinyl image.
3. Gently peel off the tape and the vinyl sticker should come off the backing strip maintaining the correct position relating to other parts of the graphic.
4. Place the transfer tape on to desired position on the model and rub down the sticker through the tape. But only over the image not into the gaps around the image.
5. Gently peel the transfer tape off leaving the sticker behind. I find peeling right to left works best but you may have to coerce the vinyl to remain on the model.
6. Once the transfer tape has been removed leaving the sticker behind. Rub the sticker thoroughly to ensure it is firmly stuck to your model.

