Corflute Control Line Trainer

1 Introduction

Traditional Control Line (C/L) trainers are usually built out of sheet balsa and are quite tough particularly if covered with tissue and properly finished to keep fuel and oil out of the wood. This model is a bit different being made from materials that are relatively easy to fashion and require minimal finishing.

At the time of writing this model is only a prototype and is based on traditional C/L trainer called “Record Trainer”, plans of which I found on Outerzone (http://outerzone.co.uk), specifically https://outerzone.co.uk/plan_details.asp?ID=5296. This model has similar dimensions and engine size but its made from Corflute and other readily available materials rather than balsa. It is meant to be tough, quick to build, require minimal painting, and be easily repairable. You could even make up spare parts making fixing on the field a possibility. This may be particularly suitable if your club has “have a go days”.

I’ll assume that you have some building experience. If you have some DIY experience then you should have enough knowledge to build this model.

Please be sure you read these instructions. This might look like a long document but that’s because it has lots of pictures to help you. The prototype took about 12 hours to build. Writing this document took longer.

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Figure 1: Finished model

2 Materials and Parts

You'll need the following:

- 5-6 mm Corflute.
- 3 mm Corflute.

- Gaffa tape
- L Section aluminium. The one I chose is 20mm by 12mm by 1.5 mm thick. Make sure the aluminium is not too thick, apart from excess weight, you will not have enough clearance to get the engine bearer bolts in.
- 20mm x 1.6mm Aluminium strip
- Glue – hot glue as delivered with a hot glue gun is recommended for gluing Corflute. I've also used Selleys Plastic Fix as well. Epoxy will not stick to Corflute.
- For glueing wood, which will be required, I prefer PVA, its cheap, easy to work with, non toxic, excess glue can be removed with a damp cloth and it dries slowly so you have plenty of time to make sure everything is properly lined up before clamping together. Epoxy or Superglue could also be used. PVA is also a suitable glue for Balsa models and my preferred model building adhesive.
- Thin superglue.
- Cable ties
- Square section pine 12mm
- Small wood screws with countersunk head, about 20mm long.
- 0.5mm Aluminium sheet. As is normal these days you'll have to buy much more than you need. Alternatively you can buy small quantities of sheet metal in model shops, but it's expensive if you compare it on a cost per square metre. If you can buy a strip of sheet Aluminium make sure it is about 1 - 1.5 cm wide.

Most of these materials used can be obtained from Bunnings.

2.1 Specialised Items

These are the specialised Control Line items you'll need to obtain. Contact you local Brodak dealer; Sullivan also make some items for Control Line. Website details are at the end of the document.

- Control line tank. Brodak has an extensive range, I suggest either of the Medium Wedge tanks BH-473 or BH-472. A clunk tank such as SU-400 or SU-401 could be used. A 2oz rectangular clunk tank could also possibly be used. Please see flying tips as well.

- Bellcrank 2” nylon or aluminium. Brodak BB-387 is suitable. However, if you use this bellcrank you will find that the supplied bolt is too short for this model. You can replace it with a similar sized bolt that fits nicely in the nylon bush; 6-32 Bolts at least 38mm long (1½”, Du Bro Cat No. 177) for instance. Do not substitute with a thinner bolt.
- Leadout wires – If this is your first model I suggest you use a leadout kit such as Brodak part BH-601 which will have all of the required items and instructions. Leadout kits are also cheap. Heavy stainless steel braided fishing line at least 0.027 inches in diameter can be used; 80 – 100lb breaking strain is plenty. If you don’t want to use a leadout kit you’ll need some aluminium tube, about 3mm diameter to make some crimps with. This tube can be cut quite easily with a cheap box cutter knife by rolling the tube under the blade.
- Pushrod retainer or clevis.

2.2 Other Model Items

The remaining items described below should be obtainable from a hobby shop or from the specialised suppliers.

- 5-6 mm Diameter Carbon Fibre at least 80cm long. Probably available in your local hobby shop. Please note dowel is not strong enough.
- 50mm (2”) Wheels. A smaller diameter will be OK but I suggest not less than 38mm (1 ½”) particularly if taking off from and landing on grass.
- 4-40 bolts, 25mm long, washers and lock nuts (or similar size, 3mm for instance). You’ll need 20.
- Propellers – suitable for your engine.
- Clevis.
- 5/32 inch outer diameter brass tube which should fit over the 4-40 bolts.
- 1/16” (approx 1.5mm) Music wire (also called piano wire)
- 6-32 Bolt at least 1½” (38 mm) long (Du Bro Cat No. 177) if you use the suggested Brodak.bellcrank.
- Nylon T-Style Control horn. Du-Bro Cat. No 237 for example.

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3 Tools

The following tools will be required. Hopefully you'll have most of what you need.

- Drill and drill bits
- File
- Hacksaw
- Box cutter knife or similar
- Steel ruler
- Pliers
- Clamp
- Square
- Tin snips

3.1 Other Tools

These tools may also be useful.

Soldering Iron (60 watt)

4 Engine

The suggested engine size is 1.5cc – 2.5cc glow or diesel (.09 to .15 cubic inches). Examples below:

- ASP 12. These are really easy to handle little engines and start really easily when cold and are quite powerful for their size.
- ASP 15. Has the same mounting hole dimensions as the ASP 12. Again really easy to start and very powerful; may be a bit too much for this model.
- Enya 15. Rugged top quality Japanese engines. You can't really go wrong with these.
- O.S. 15. As above.
- A.P 15. Cheap, well made and very easy to start.

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A venturi is preferable for engines used in control line airplanes but they can be difficult to get hold of. If you use an engine with an RC throttle you'll need to wire the throttle in the fully open position. See photos of finished model.

I chose an AP 2.5cc Hornet, available at very low cost from Hobby King. A couple of things I didn't anticipate with this engine. Firstly as the muffler is mounted at the rear of the engine rather than the side (like the vast majority of smaller model engines) this effectively makes the engine longer (if using a muffler) reducing the space for the tank. Secondly, the spacing between the bearer holes and the crankcase is very small. If the spacing is too small then it will be difficult to get the bolts into the bearers because the holes in L section aluminium will be too close the inner corner of the L. See the photo below of the modification I had to make.

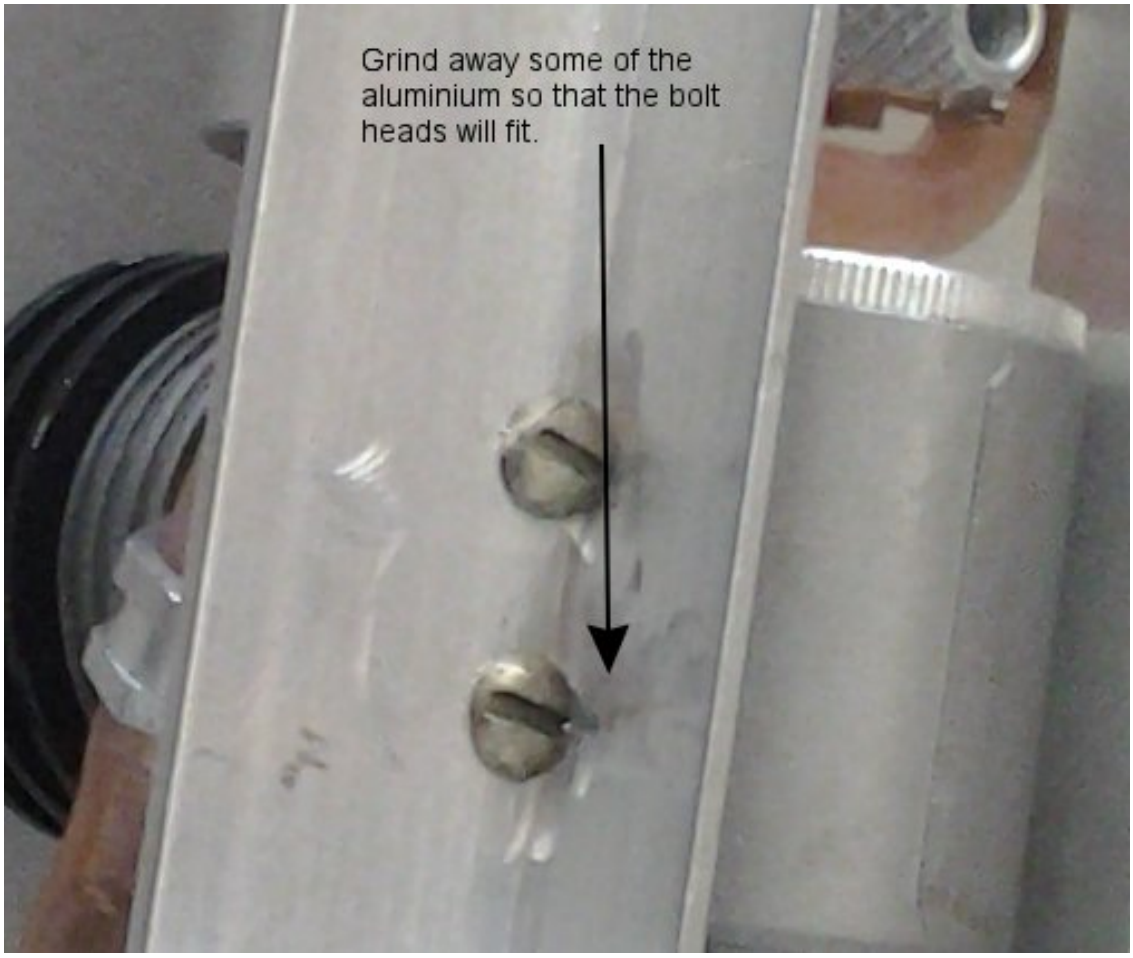

Figure 2: Closeup of the engine mounting

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With another experimental Corflute plane I made with the same engine bearer setup I used an Enya 15 which fits fine. I believe an ASP 12 or 15 will also fit quite comfortably too. You may need to experiment but don't ruin an engine by trying to make its bearer holes bigger for instance. Experiment with the cheap stuff, the aluminium you can get from your local hardware store.

Flying experience showed that the 2.5 cc engine was adequate. Given the resulting model was quite heavy if you choose as smaller engine make sure its a good one.

5 Construction

5.1 Wing

Cut the wing as described below from your 5mm core flute. It's nothing fancy just a flat plate, we're not building a precision stunter.

The wingspan is 80 cm, 14cm chord at the midway point (40cm) at centre and 10cm at tips. Cut the leading edge along a flute leaving a U shape where the carbon fibre rod will sit.

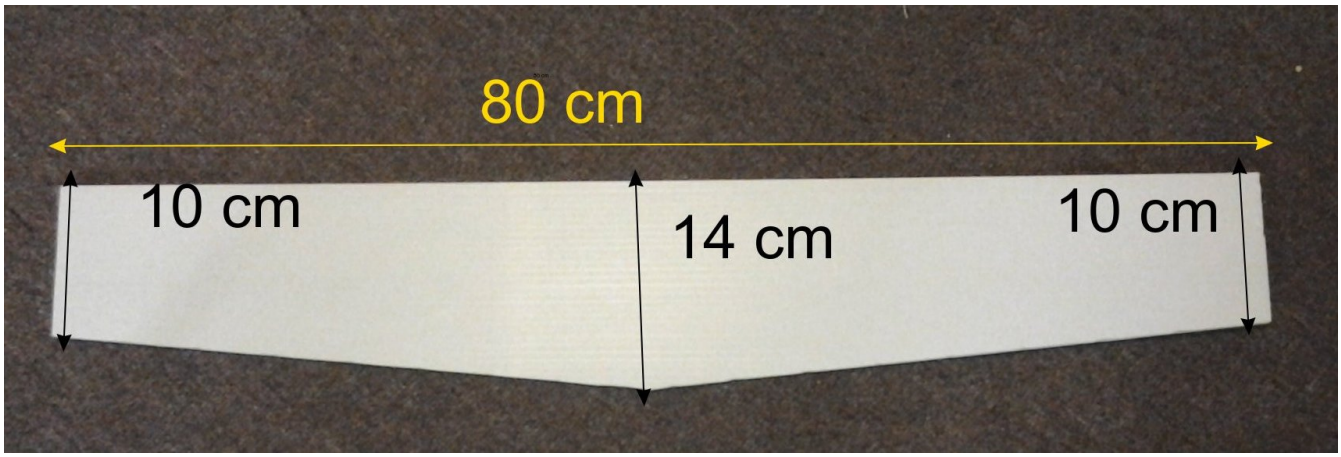

Figure 3: Wing Dimensions

Glue the carbon fibre reinforcing rod edge onto the U shaped section at the leading edge of the wing. I used a hot glue gun for this but you can also use Plastic fix (see materials). I suggest you trim the carbon fibre after you've glued it because which ever glueing method you use you won't have much time to position it before the glue sets.

Figure 4: Wing with reinforcing carbon rod

Wrap a piece of Gaffa tape over the leading edge. It is suggested you varnish over the edges so that fuel and exhaust oil doesn't get under the edges of the tape. Bondall Monocel marine varnish seems to work well.

5.2 Tailplane

The tail-plane is cut from 3mm core flute. It would probably be OK to use 5mm for the Tailplane. Dimensions; chord 9 cm at centre, 6.5 cm at tip. Span of tailplane is 29 cm, midway point 14.5 cm. The elevator is 2.5 cm by 29 cm. Note if you use thicker Corflute it will also be heavier so the Centre of Gravity (CG) of the plane will be further aft. You might want to move the engine forward.

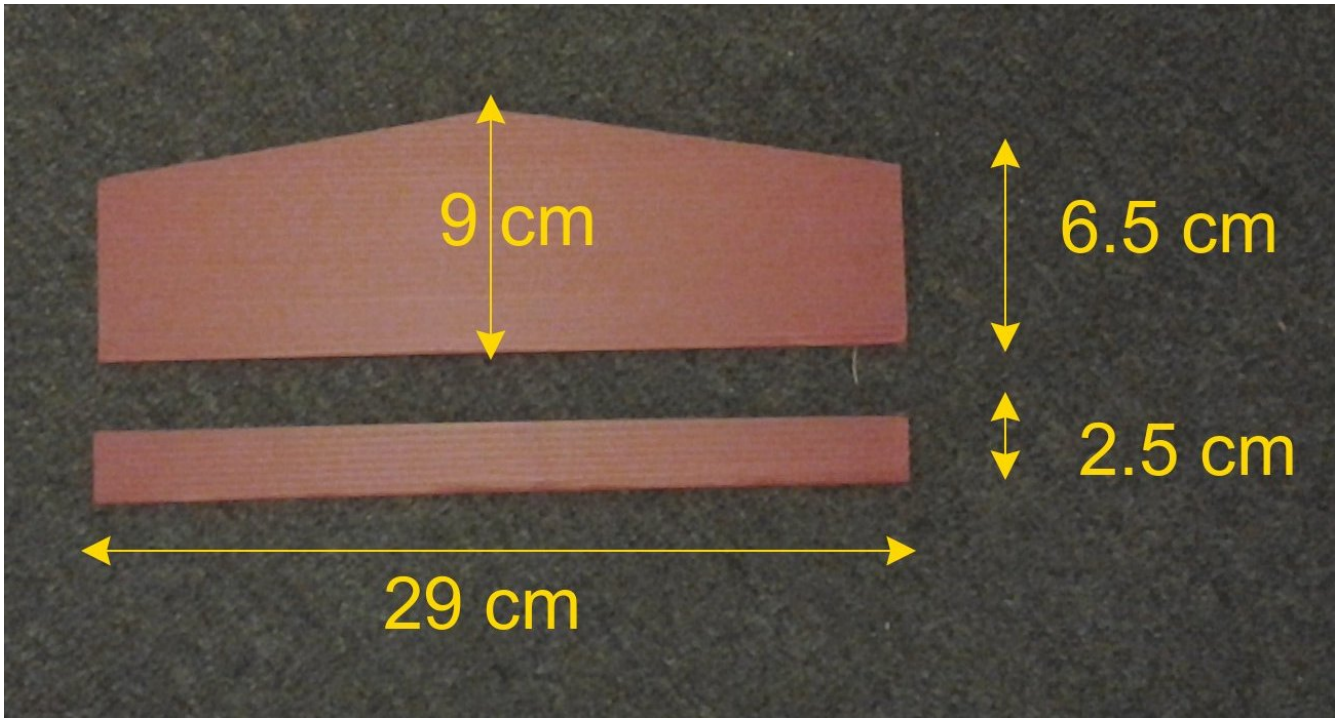

Figure 5: Tailplane Dimensions

5.2.1 Making and Fitting the Hinge

Cut 8 pieces of your 0.5 mm aluminium strip about 1.5 cm wide and about 6 cm long. The dimensions are not critical. Find something that is round and fractionally thicker than your 2mm wire, such as a nail and fold the thin aluminium strip over the nail (or whatever you've chosen to use). Cut a piece of your music wire 29cm long and bend ends at about 1cm through 90 degrees. These ends need to be parallel and the whole thing should not be twisted. Crimp the aluminium strips over the wire. But don't crimp too close to the wire. Make sure the wire will rotate freely in the strips.

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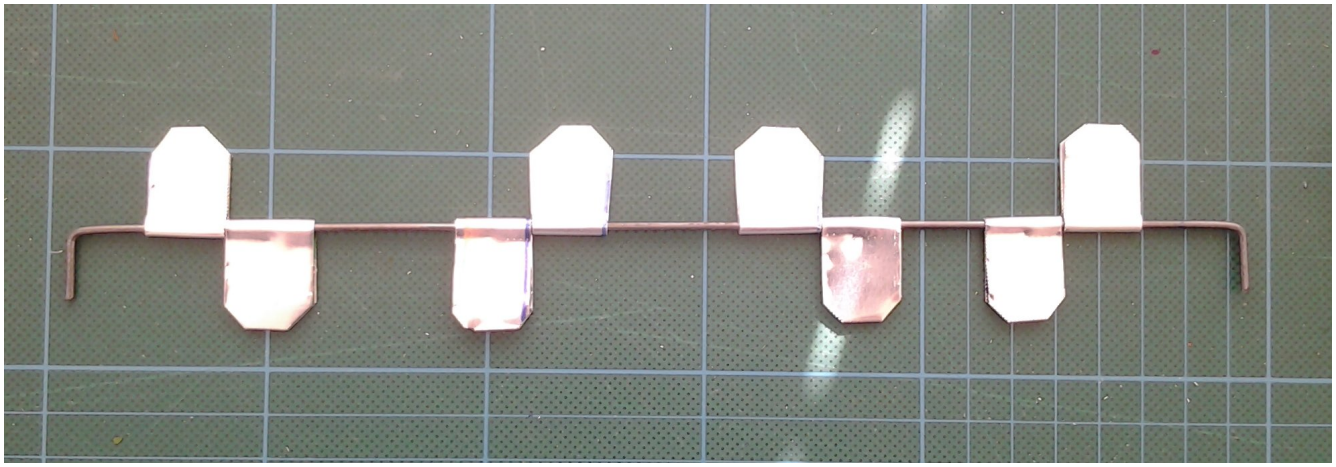

Figure 6: Assembled hinge

Poke holes in the elevator to receive the ends of the wire. Use your knife to cut some slots in the Corflute tailplane and elevator as shown below. If you have one, a hobby knife with a curved blade makes this job easier.

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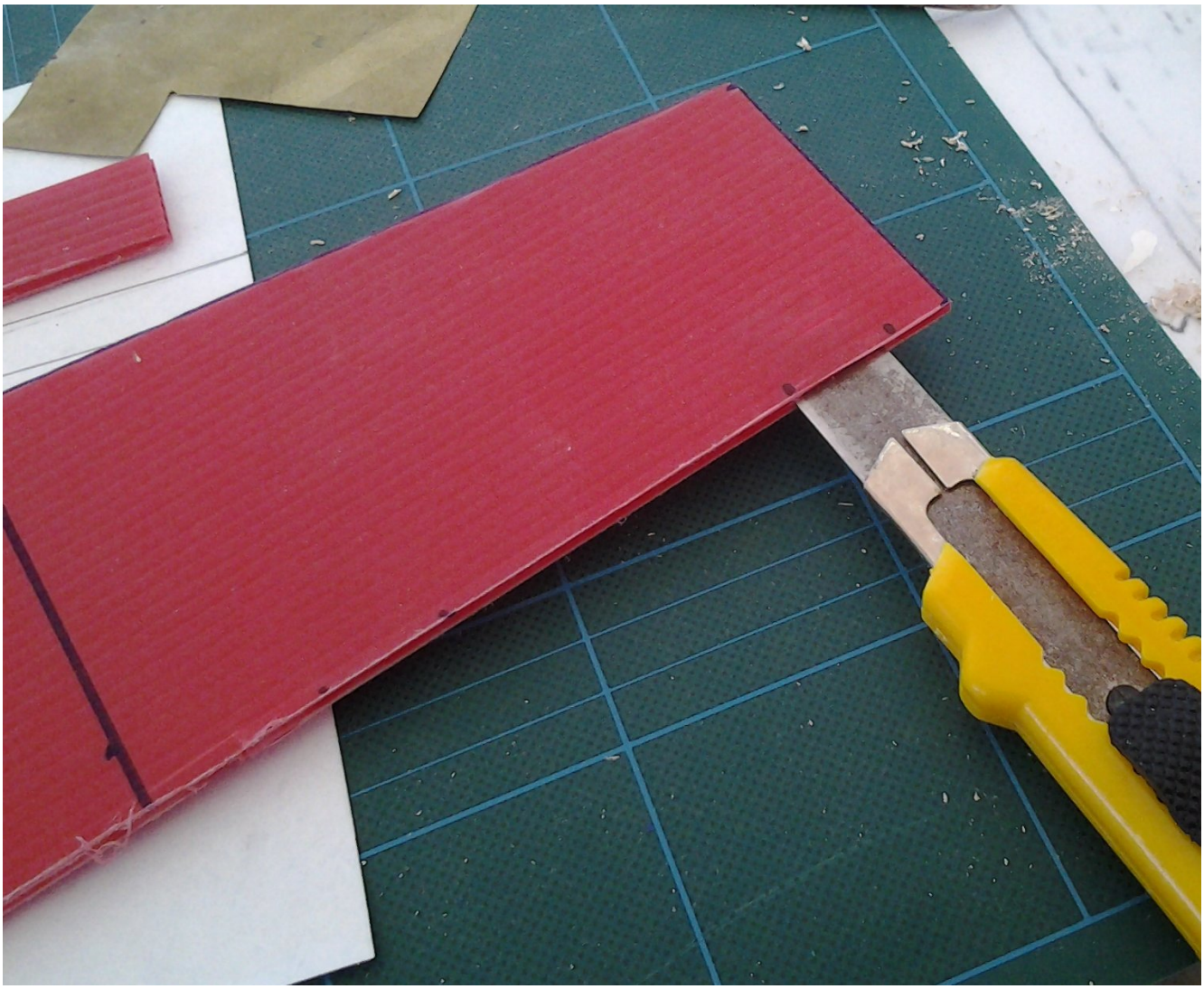

Figure 7. Cutting a slot in the tail-plane. Note the marks showing where the tongues will be inserted.

Assemble the elevator getting the gap between the elevator and tailplane as small as possible. Adjust the position of the hinges so that the elevator moves freely and is not stiff. If, for example, the elevator moves to certain position, gets stuck and then moves freely you probably haven't got the hinges aligned properly. The wire for the hinge must be straight for free movement. **An elevator that is stiff or moves in a jerky manner will make the model difficult, if not impossible, control**.

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Cut a small amount of Corflute away from around the tongues for the hinge. Put the elevator over a square edge and inject superglue into the areas you've just cut away being careful not to get glue into the hinge itself, we are trying to glue the tongues into place. Corflute is cheap, you may have to have several goes at getting the elevator and tailplane right. It took me a couple of tries to come up with something that I hope is not too difficult. Glue the ends of the hinge wire into the elevator again being careful not to get glue into the hinge.

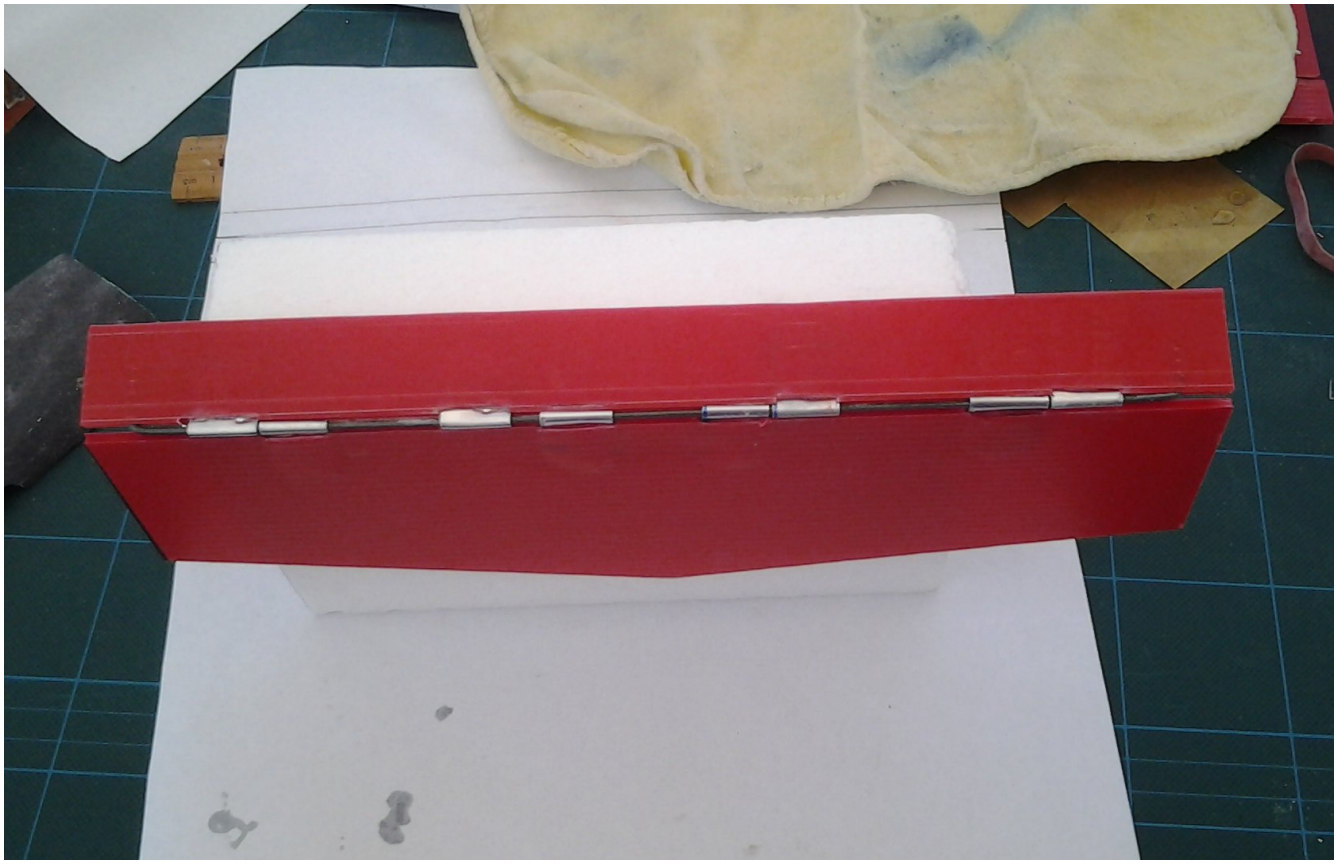

Figure 8: Hinge assembly ready to be glued

The hinge assembly is the one of the most critical parts so take your time to get it right.

Install the T horn as shown below. The holes for the pushrod should be over the hinge line. Position the horn about 1 cm left of the centre line as viewed from above. Put a piece of tape over the leading edge of the elevator.

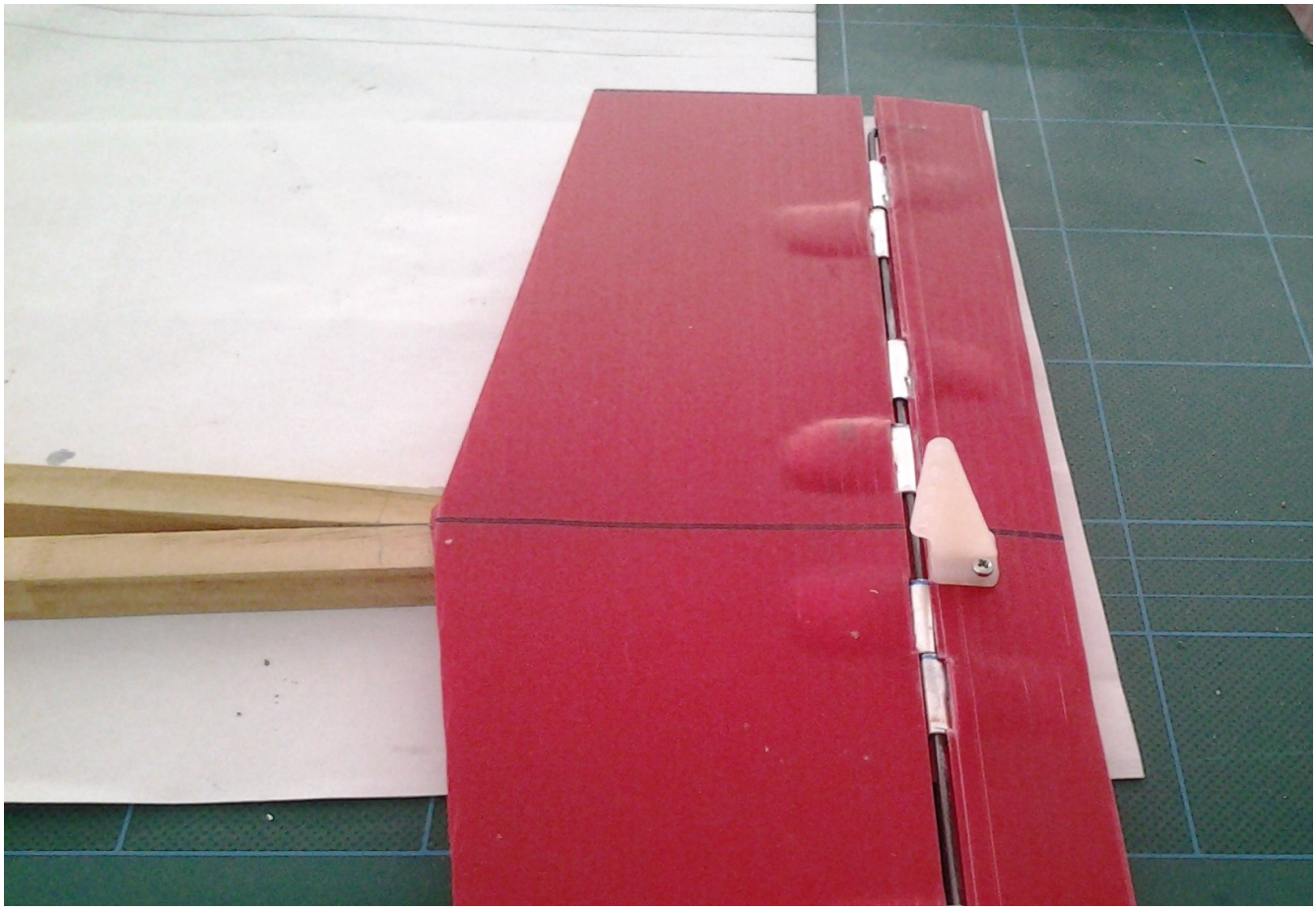

Figure 9: Tailplane with control horn installed

5.3 Fin

The fin is 4 cm along the top, 8 cm at the base and 6cm tall cut from a piece of 5mm scrap Corflute. The dimensions are not critical, a few mm either way won't make much difference. Cut the Fin so that the flutes run horizontally. Put a piece of tape over the leading edge of the fin. Sorry, I forgot to take some photos of this stage.

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5.4 Fuselage

5.4.1 Crutch

The fuselage crutch is made from 2 pieces of 12mm square section pine 40 cm long. To make it proceed as follows. Draw 2 parallel lines on a piece of A4 paper (landscape orientation) the same distance apart as your engine bearers. Draw a centre line between the 2 lines you have just drawn. Place one crutch over the drawing. Note the pencil line 10cm from the end of the crutch. One end is just outside the outer line and the centre of the square section is placed over the centre line. Place the other crutch over the first one in the same manner. You can then draw a line and cut off the wedge. Steps illustrated below.

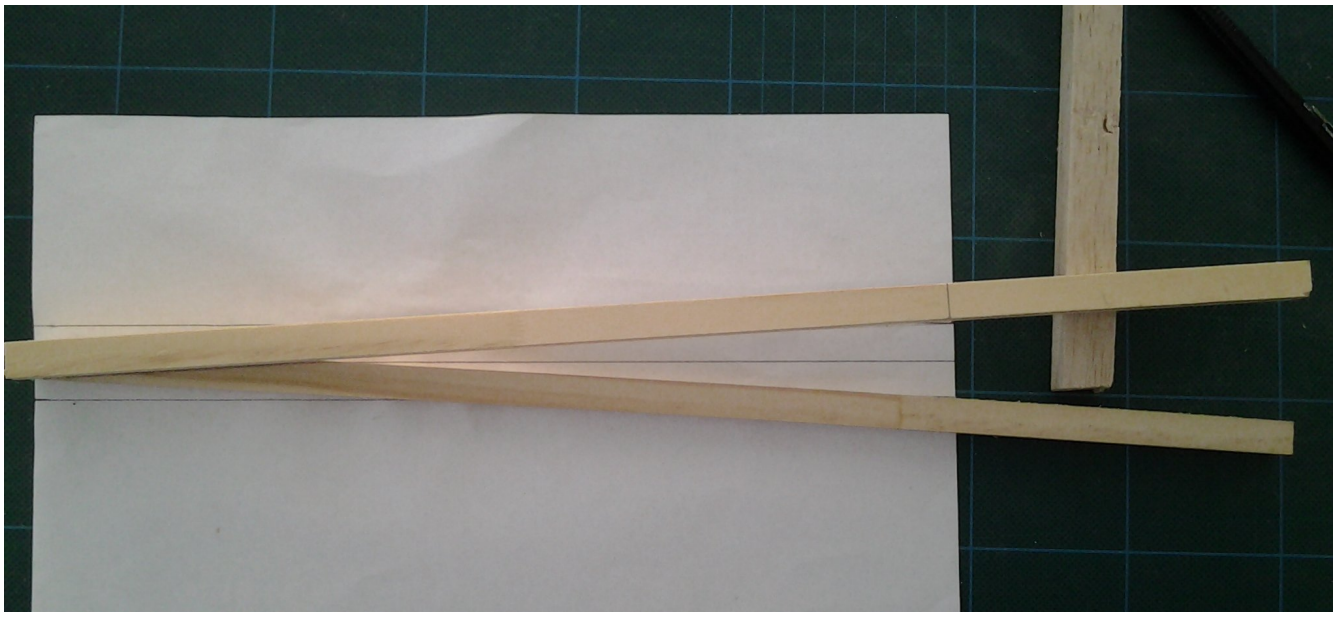

Figure 10: Position the legs of the crutch

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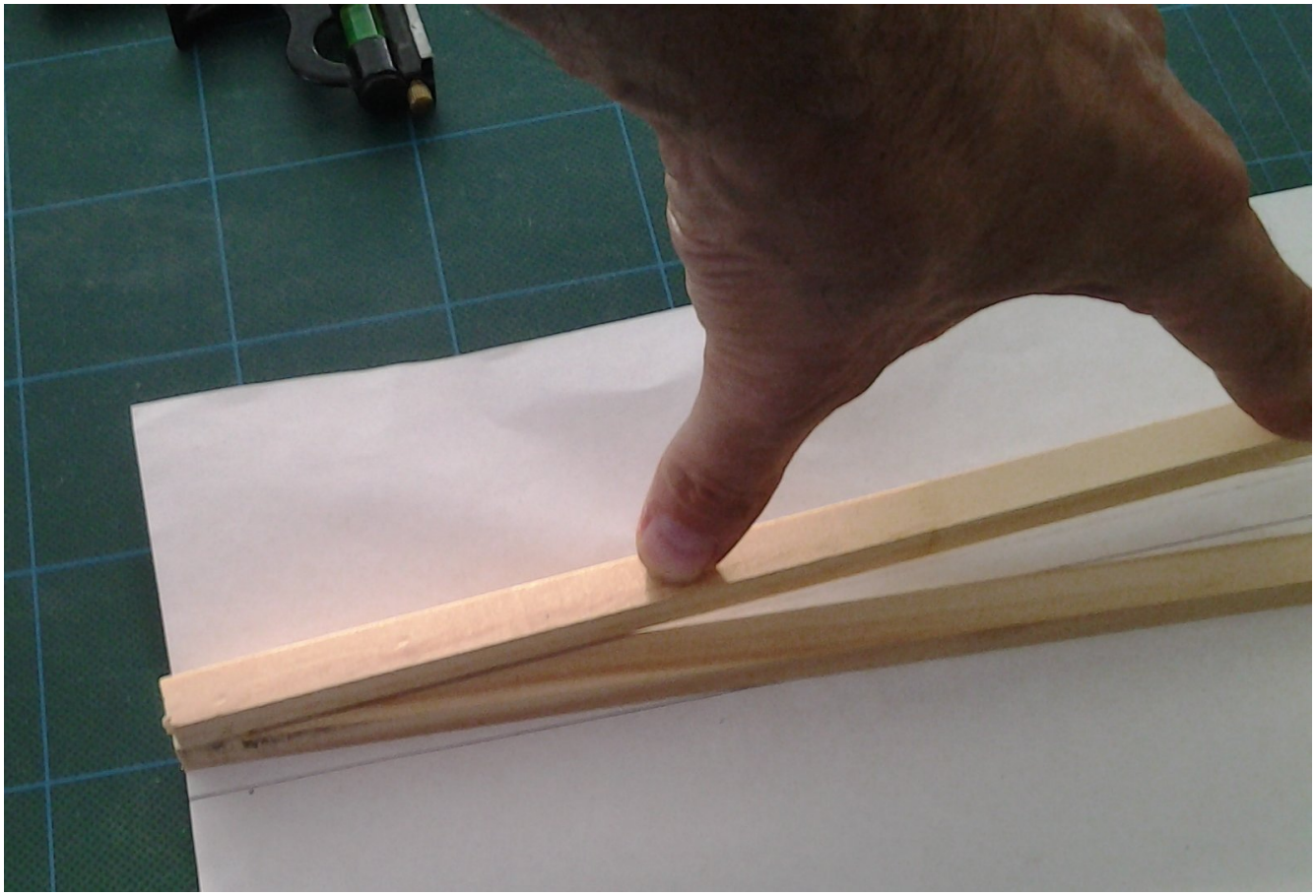

Figure 11: Draw a cut line

Try to get the resulting surfaces you've just cut as flat and square as possible.

Glue the crutch together making sure the whole assembly is flat. Glue the wedge you cut off, coloured blue in Figure 11 below, to clamp the crutch together and create a platform for the tailplane. Position the ends so that the legs of the crutch are approximately the same length. This might seem like an odd way of joining two pieces of wood to form a V but it means that only one cut needs to be made and the assembly is easier to clamp together.

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Figure 12: Crutch assembly ready to be glued

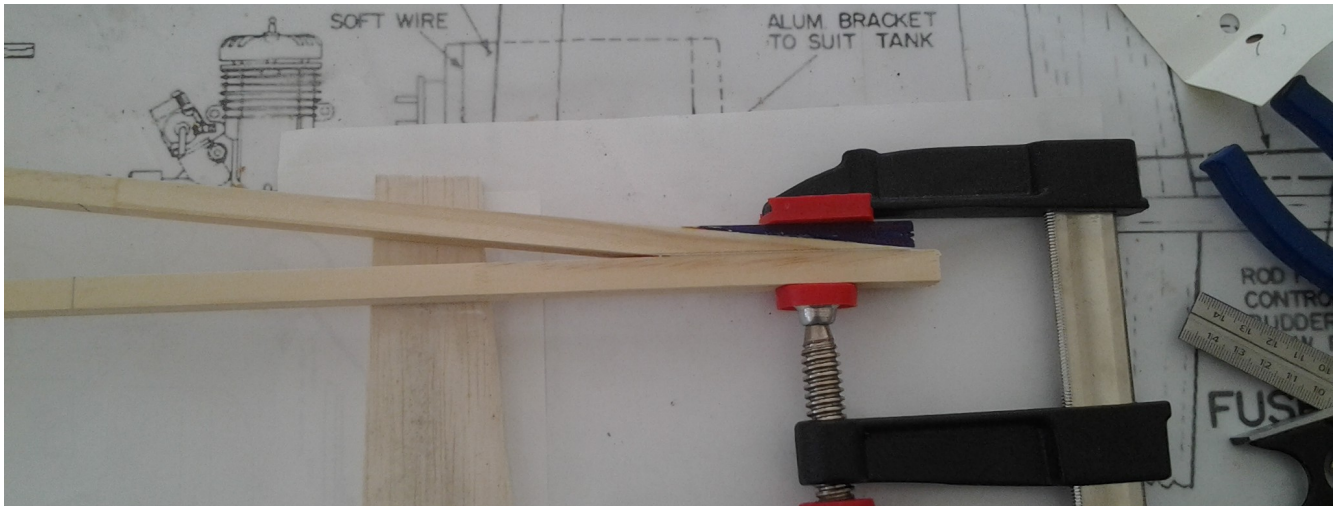

Figure 13: Glueing and clamping the crutch

Paint the structure with a polyurethane based paint or varnish to keep oil out of the wood and provide some protection from fuel. Reinforce the joined end with a bolt.

The skid is bent from a spare piece music wire. I suggest you make it after you've made the pushrod and elevator hinge. You should have enough left over. The dimensions are not

critical. The long legs are about 4cm and the short legs about 1cm. Attach during final assembly.

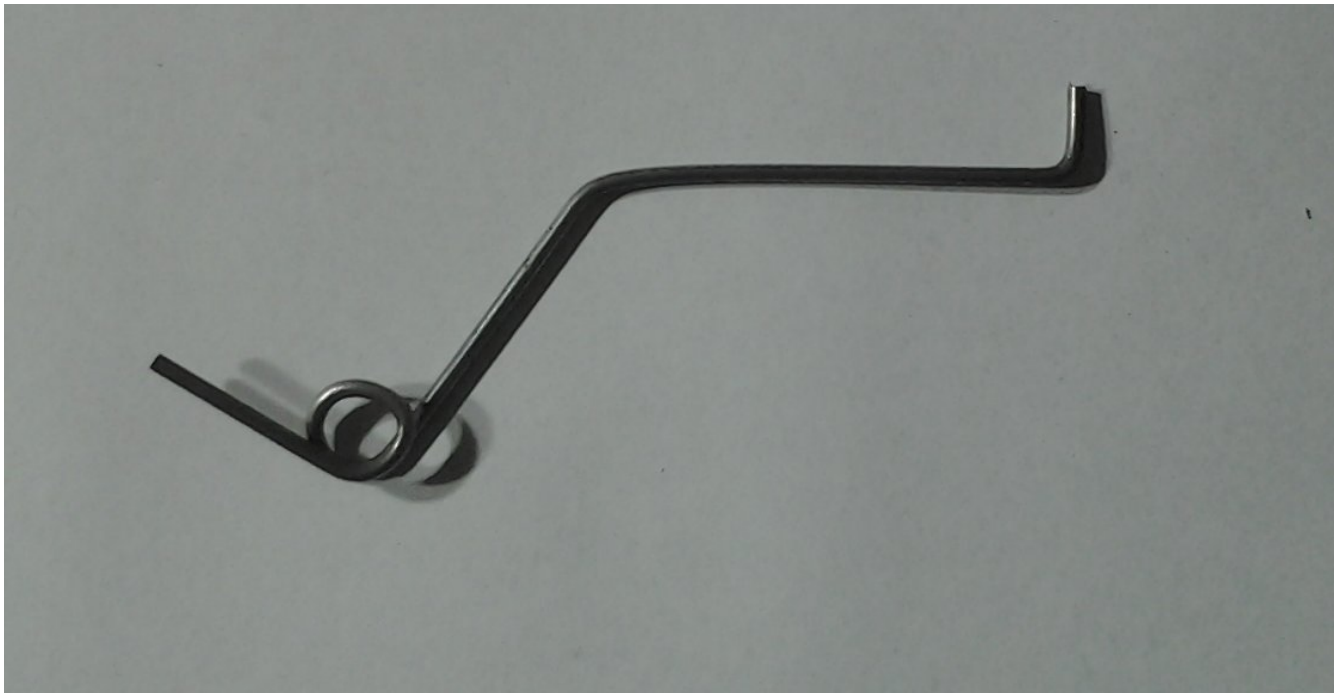

Figure 14: Tailskid. The loop is optional and intended for use with a self launching device

5.4.2 Engine Bearers

The Engine bearers are cut from L section aluminium and are 27 cm long. Drill holes as to accept engine. One problem I didn't anticipate was that the engine I have chosen to use has quite small engine bearers which means that the resulting holes are too close to the corner of the L to accommodate 4-40 bolts. In this instance I used a hobby grinder to remove enough aluminium to accommodate the heads of the engine bearer bolts, see Figure 2 Closeup of the engine mounting on page 6. Incidentally a hobby grinder like the Dremel 2001 is well worth buying in my opinion. Not only is it useful for grinding as described above its also very useful for cutting bolts and music wire (most bolts will should to be trimmed for this model, though in most cases it won't matter if you don't). This is will be a lot easier than trying to find the various lengths you need and is definitely quicker, easier and neater, than using a hacksaw.

The hole for the bell crank is 18cm from the front of the bearers and the leading edge of the wing is 12.5 cm from the front of the bearers. Drill 5 other holes as illustrated in Figure 29

Attachment of wing, crutch and bearers on page 33. The blue lines across the bearers indicate where the leading edge of the wing will be placed. The four rear holes must go through the crutch as well as the bearers.

Optionally, you can lighten the bearers by making some holes between the rear two wing mounting holes. I made 10mm in diameter holes which have centres 15mm apart.

5.4.3 Undercarriage

The undercarriage is cut from the 1.6mm by 20 mm strip to the dimensions shown below.

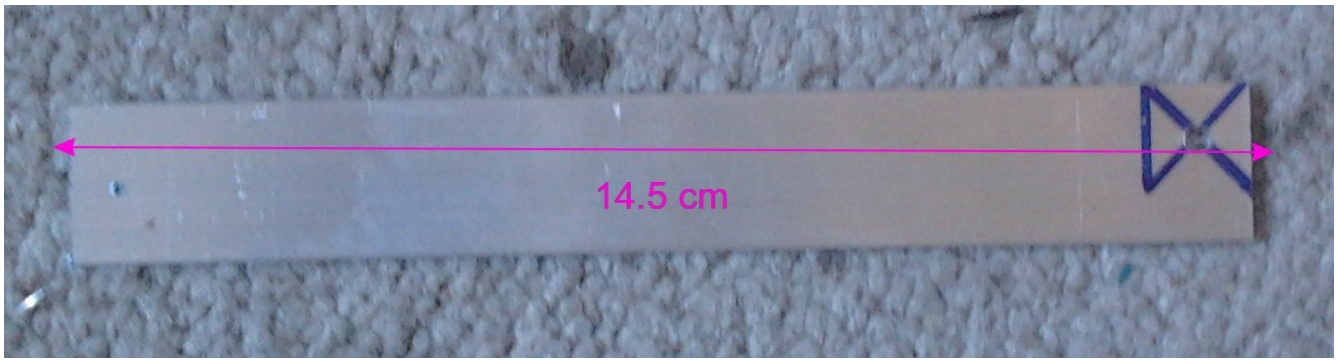

Figure 15: Undercarriage Leg

The aluminium strip is relatively easy to bend with a vice and a block of wood. Note the shape at the top. The dimensions I used here suit the vice I used to do the bending. These dimensions are not critical the idea is to make a corner that fits into the L section aluminium bearers. Before bending make sure you have the aluminium strip squarely in the vice, check this with a set square.

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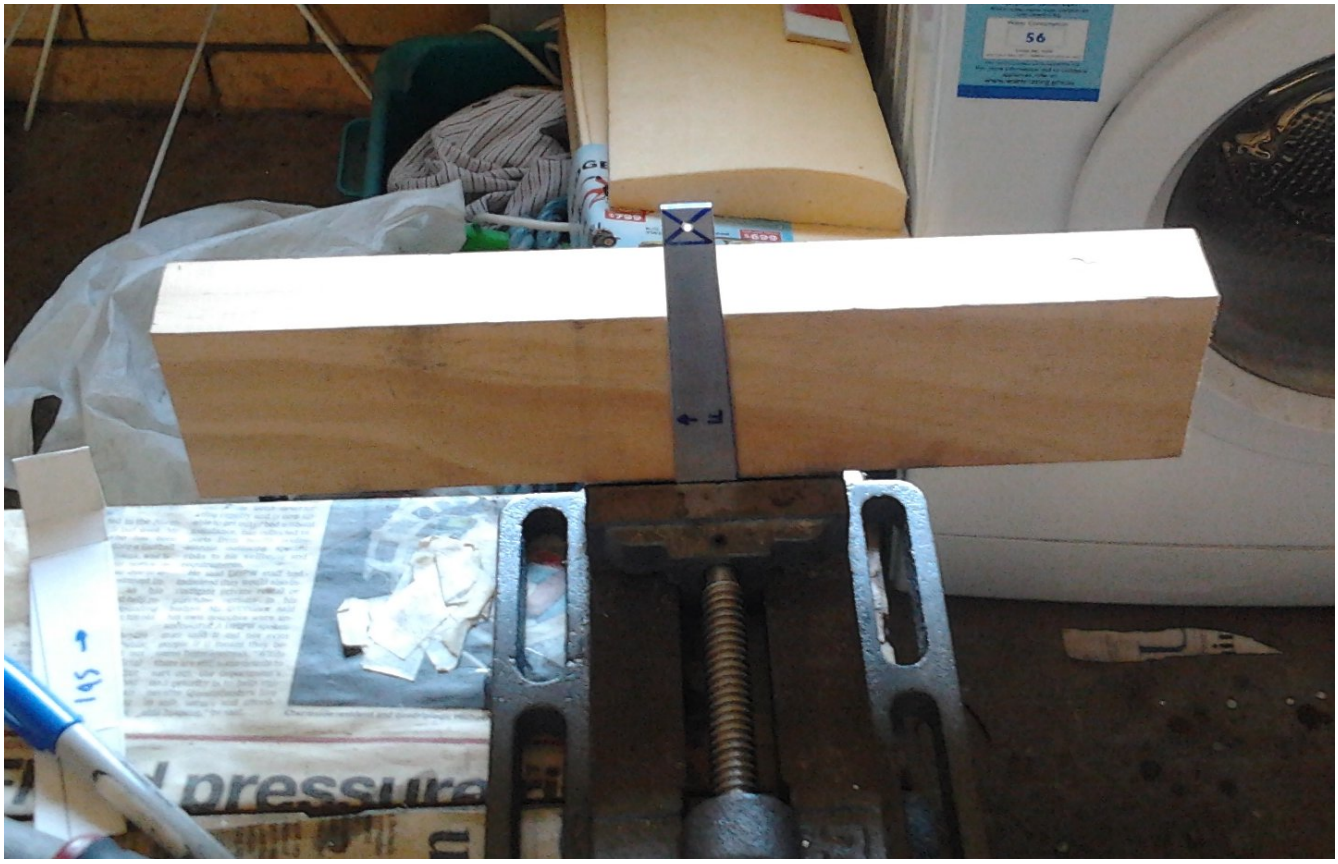

Figure 16: Preparing to bend an undercarriage leg

As you can see from my photos below I've prettied up the undercarriage by tapering the legs and rounding the bottom ends. This isn't really necessary but I suggest you at least remove the sharp corners from your undercarriage legs. The hole is about 5mm from the end of the leg. Make sure the legs are mirror images of each other. Drill two holes in the undercarriage leg and the bearers to fix the undercarriage forward of where the wing will be placed, as illustrated below. You'll need to make sure the holes in the undercarriage and bearers match up.

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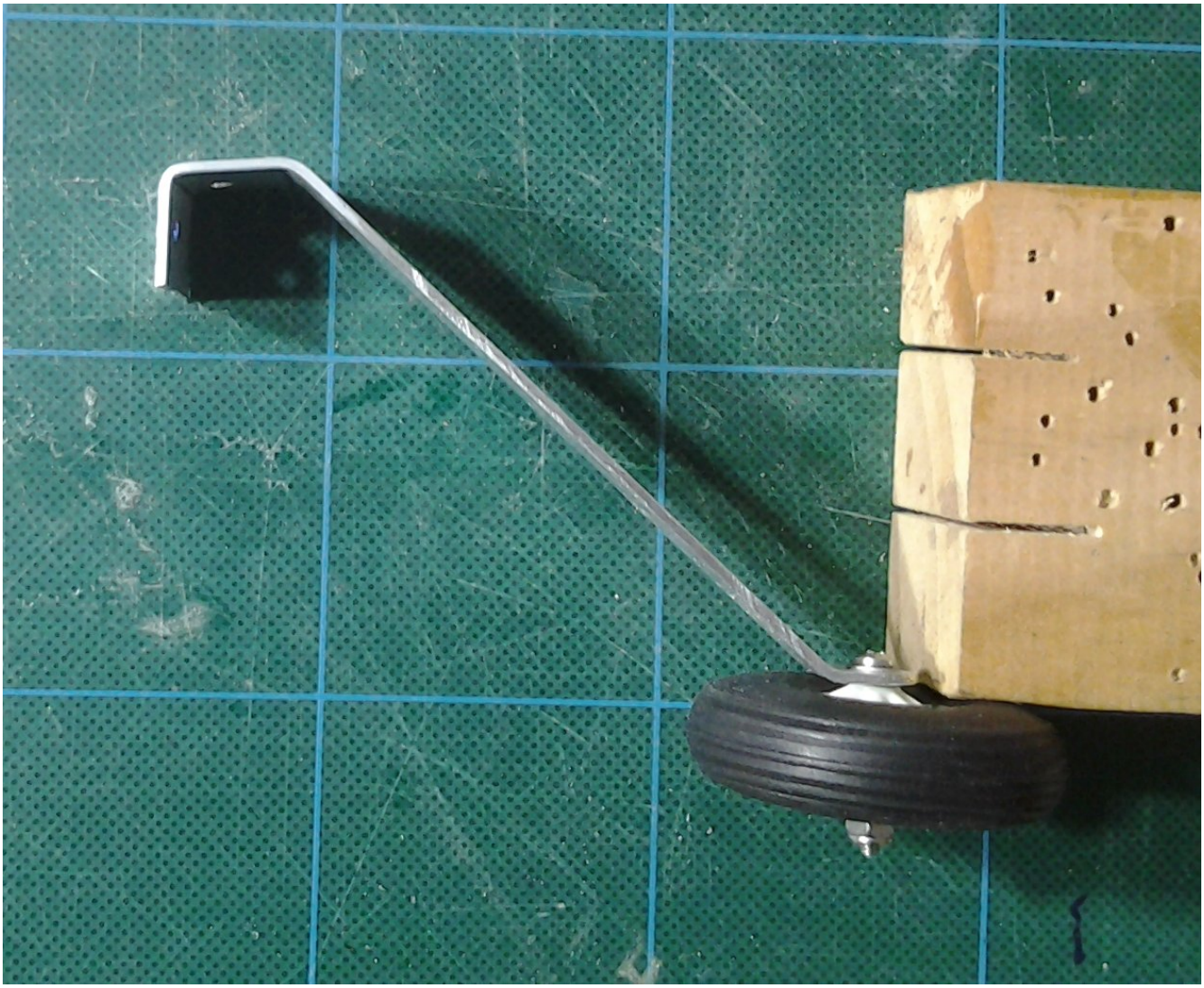

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If you are using a propeller with a diameter greater than 8” (20cm) you may need to make the legs a bit longer than detailed here. This could be necessary if you are using a diesel engine which will swing larger diameter propellers than the equivalent capacity glow engine. You could make the undercarriage narrower and taller.

A single straight leg for an undercarriage should also work, I have other C/L planes with a single wheel and this arrangement works fine.

The axles are made from 4-40 bolts. Slip a short length of brass (or aluminium) tube over the bolt so that the threads don’t gradually wear out the wheel hubs. Note that the tube should be slightly longer than the length of the hole through the wheel hub. The wheels should rotate freely.

Dill holes in the undercarriage and bearers so that the undercarriage will fit as illustrated below.

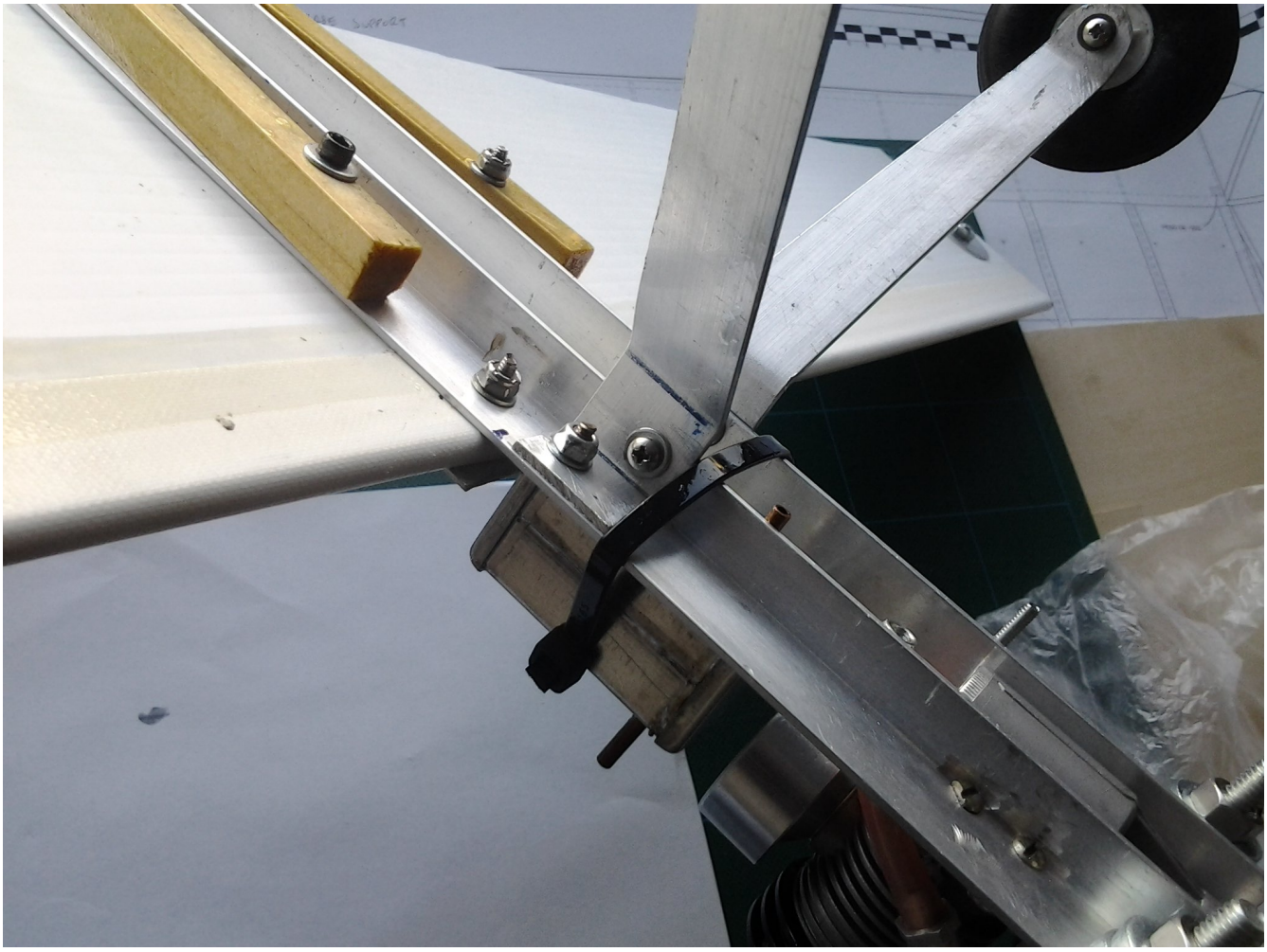

Figure 17: Undercarriage fitted to finished model

5.5 Controls

It is critical that the bellcrank bolt is attached to the engine bearers. This is the strongest part of the plane and it ensures that whatever else happens to the plane the engine is effectively attached to the lines (and you!) A commercial bellcrank will supply installation details. In our case the bellcrank bolt passes through engine bearer and the crutch underneath. Note the aluminium plate underneath the bell crank which is used to prevent the Corflute from being crushed when the bellcrank is secured.

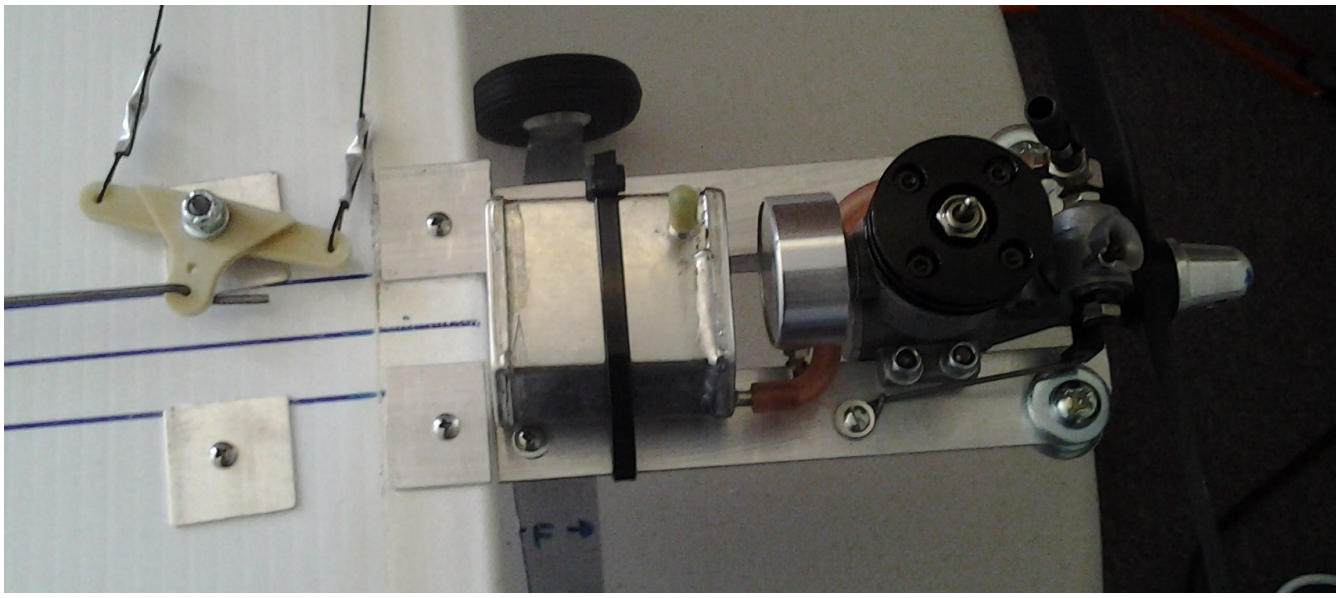

Figure 18: Bellcrank and tank final assembly

Fit the leadouts to the bellcrank. The other ends, at the wingtip, are not made until after model has been assembled. If you are not using a leadout kit you can make the leadouts as detailed in Appendix B

The pushrod is bent from a piece of 1/16 inch (Approx 1.5mm) music wire, don't use softer wire. At the end that goes through the bellcrank make a Z bend. If you are using the recommended bellcrank you may need to enlarge the pushrod hole slightly. If you haven't worked with music wire you'll find that it is not easy to bend. Music wire should be bent cold; heating it to bend it will soften the wire. An easy way to make a Z bend is as follows.

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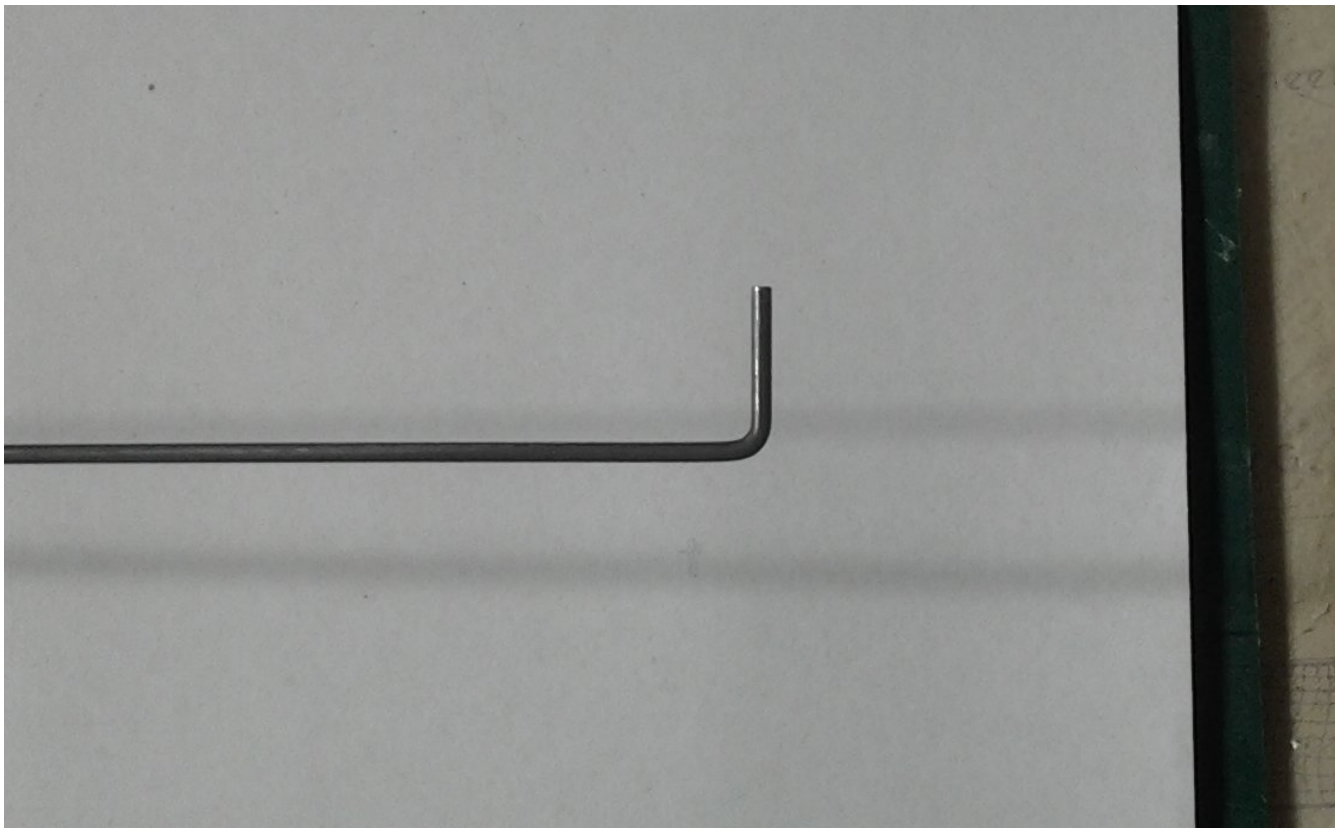

Figure 19: Z Bend, first bend through 90 degrees

Figure 20: Z bend: second, bend the wire towards you through 90 degrees.

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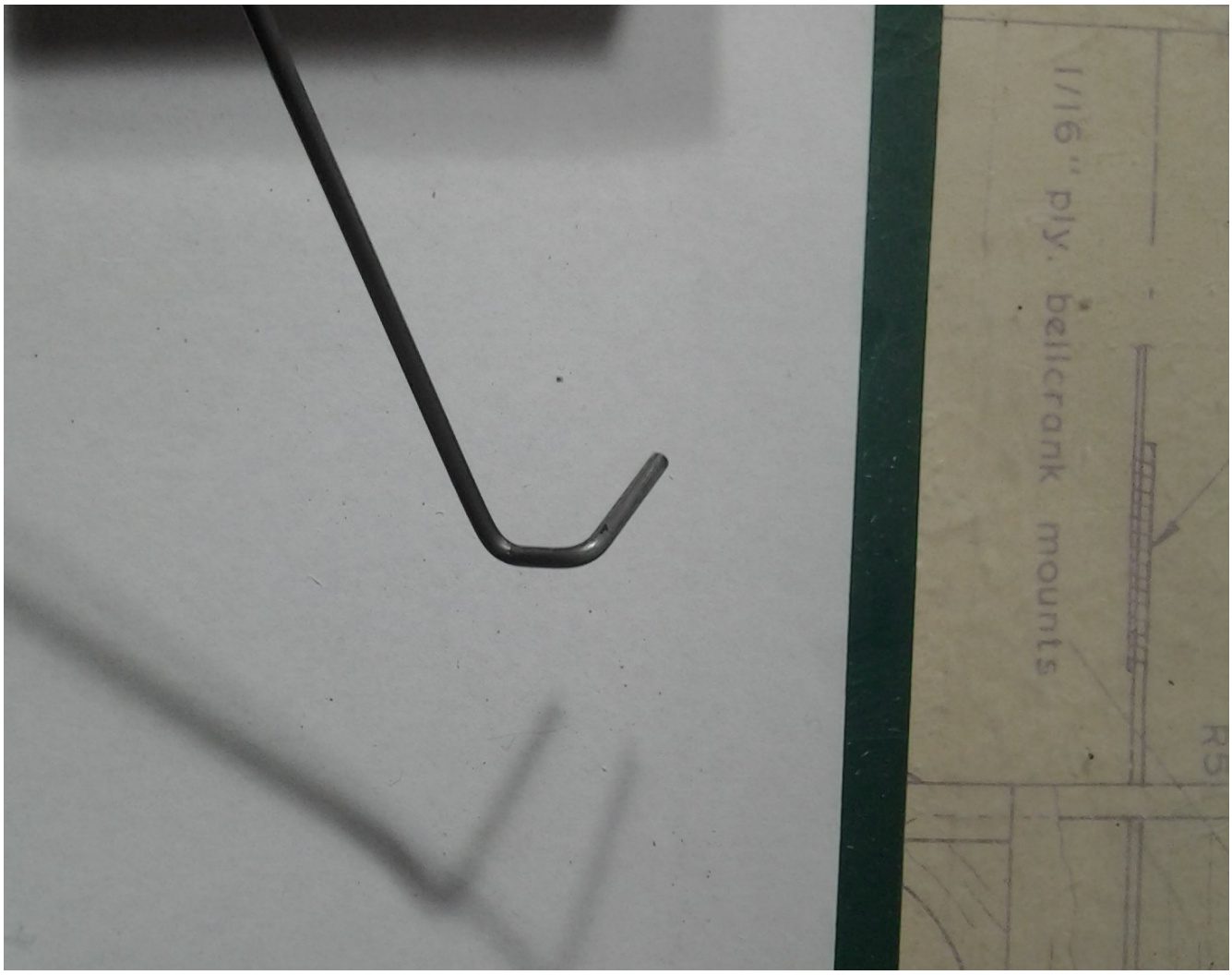

Figure 21: Z Bend. After the second bend

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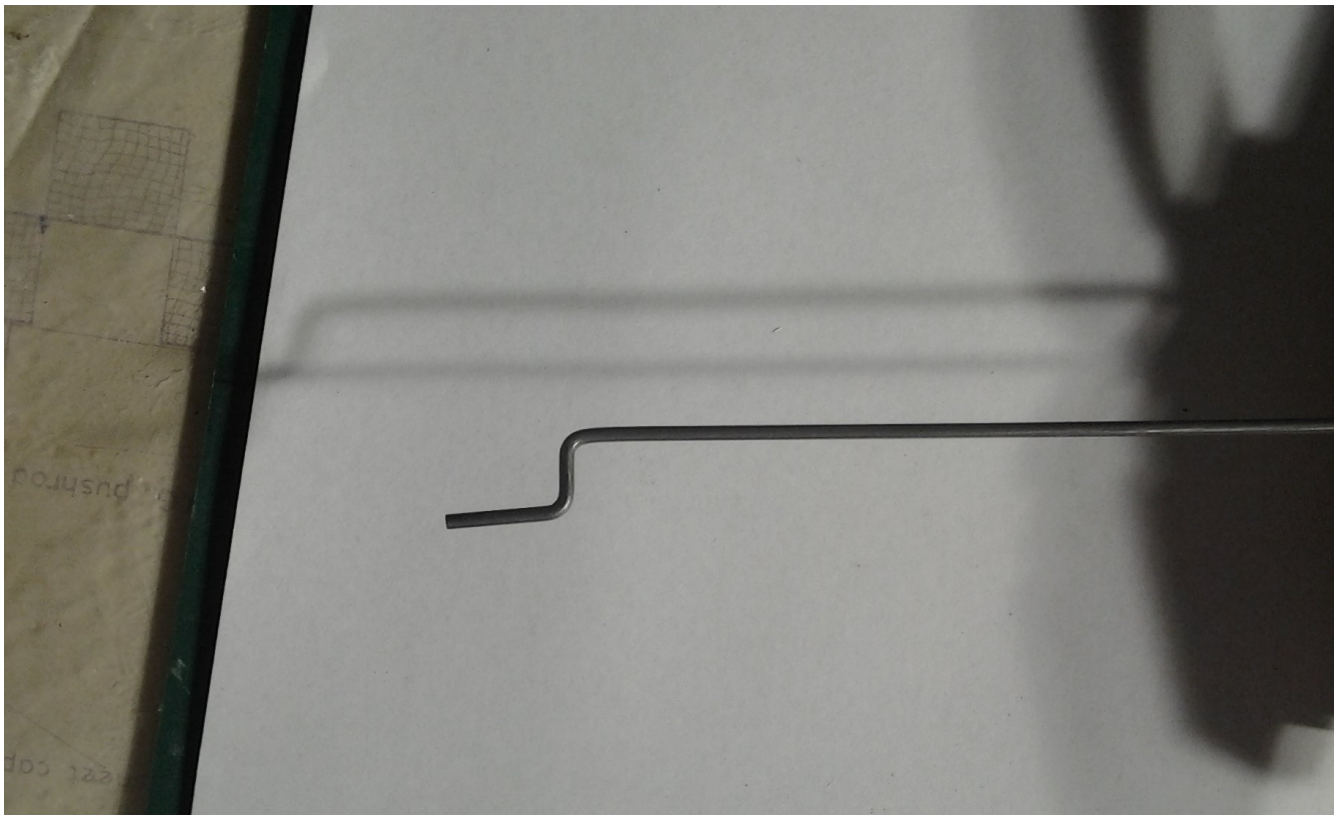

Figure 22: Z bend, twist the bend to flatten it out.

There are several ways you can attach the pushrod to the control horn; a simple bend with a retainer, an adjustable clevis I.e one that fits on to a threaded rod, or a non adjustable clevis as used on this model.

Figure 23: A pushrod held on with a retainer

At the other end you want to arrange the bend or position of the clevis such that the elevator moves the same amount up and down movement. If you get it wrong don't panic. If you have a soldering iron you can adjust the length of the rod by cutting a small length out of it, about 3mm, and solder a brass tube over the ends to get the length precisely. If you do this in situ make sure you protect your model from hot solder. To solder music wire it needs to be clean, use garnet paper to remove the dull oxidation and tin the wire before soldering. Initially put the pushrod through the top hole of the control horn. This makes the model easier to control.

Make the lead out guide with a piece of coat hangar wire. First bend two loops about 2.5 cm apart. The first loop should be about 5cm from the end of the wire. Next bend the wire at 90 degrees with the loops about 2cm from the bends forming a U shape with the loops at the bottom. Finally bend the legs of the U so that the loops sit about ½ cm above the legs of the U. these legs should be about 4cm long.

The bending steps are shown below.

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Figure 24: Bend two loops

Figure 25: Bend to make the prongs

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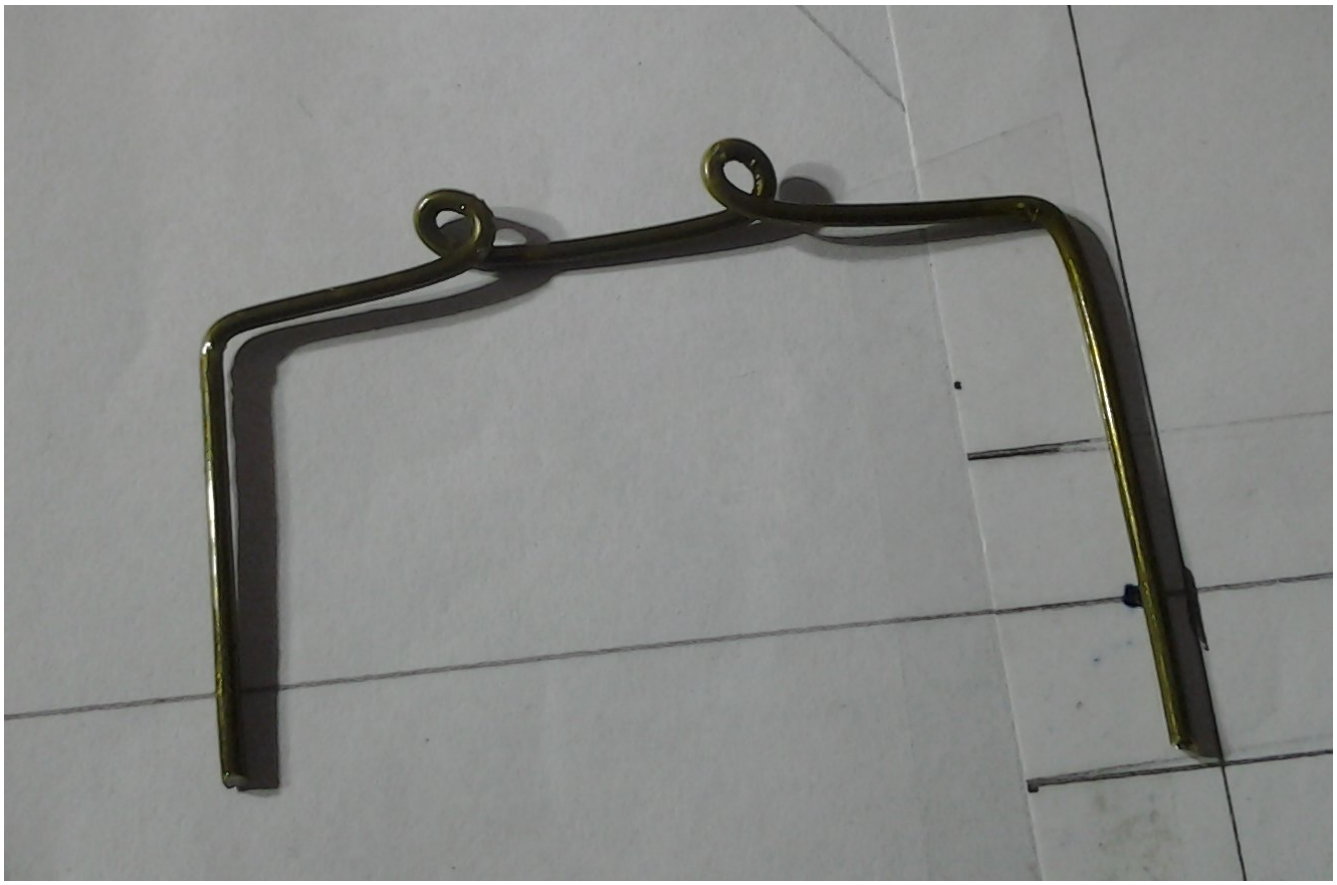

Figure 26: Trim the prongs

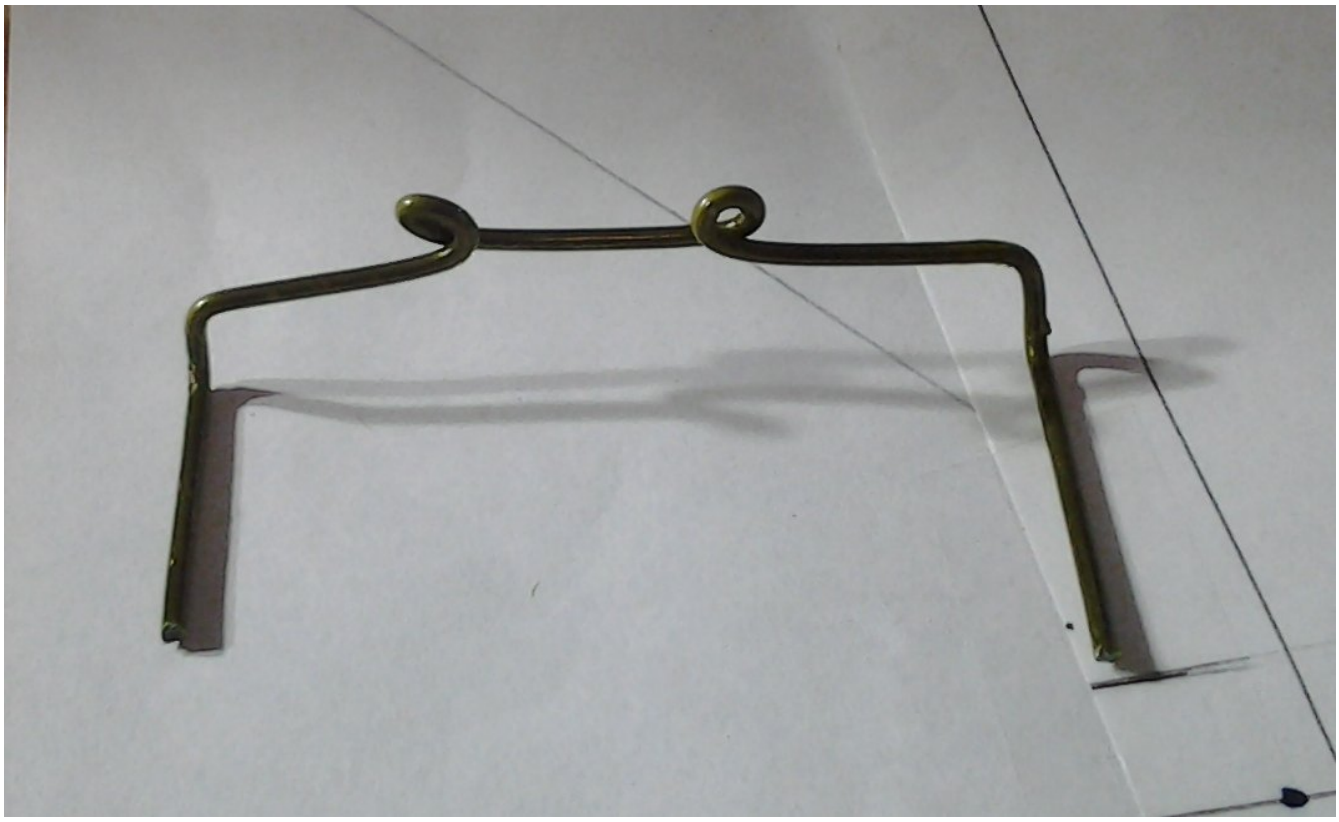

Figure 27: Bend the loops up so that they sit above the prongs by about 1cm

Wrap some tape around the prongs so that they fit snugly into the channels of the Corflute. The rear loop should be 3cm from the leading edge. Glue in place.

5.6 Final Assembly

Cut a piece of your 1.6 mm x 20mm Aluminium strip 8.5 cm long and drill 4 holes about 5mm from each corner and 2 holes on the centre line about 1.5 cm from each end. Sand the base of the fin so that the edges are nice and straight and attach, with the wood screws, to the piece of aluminium you've just cut and drilled.

Align and fit the tailplane as follows. Draw a centre line along the length of the tailplane as illustrated and lay the tailplane on the plan used to make the crutch. Align the centreline you just made on the tailplane with the one on the plan. Then lay the crutch on top of the tailplane as illustrated below. Note you are effectively viewing the tailplane assembly from below. The

hinge line should be at 90 degrees to the centre line of the line bisecting the triangle made by the legs of the crutch.

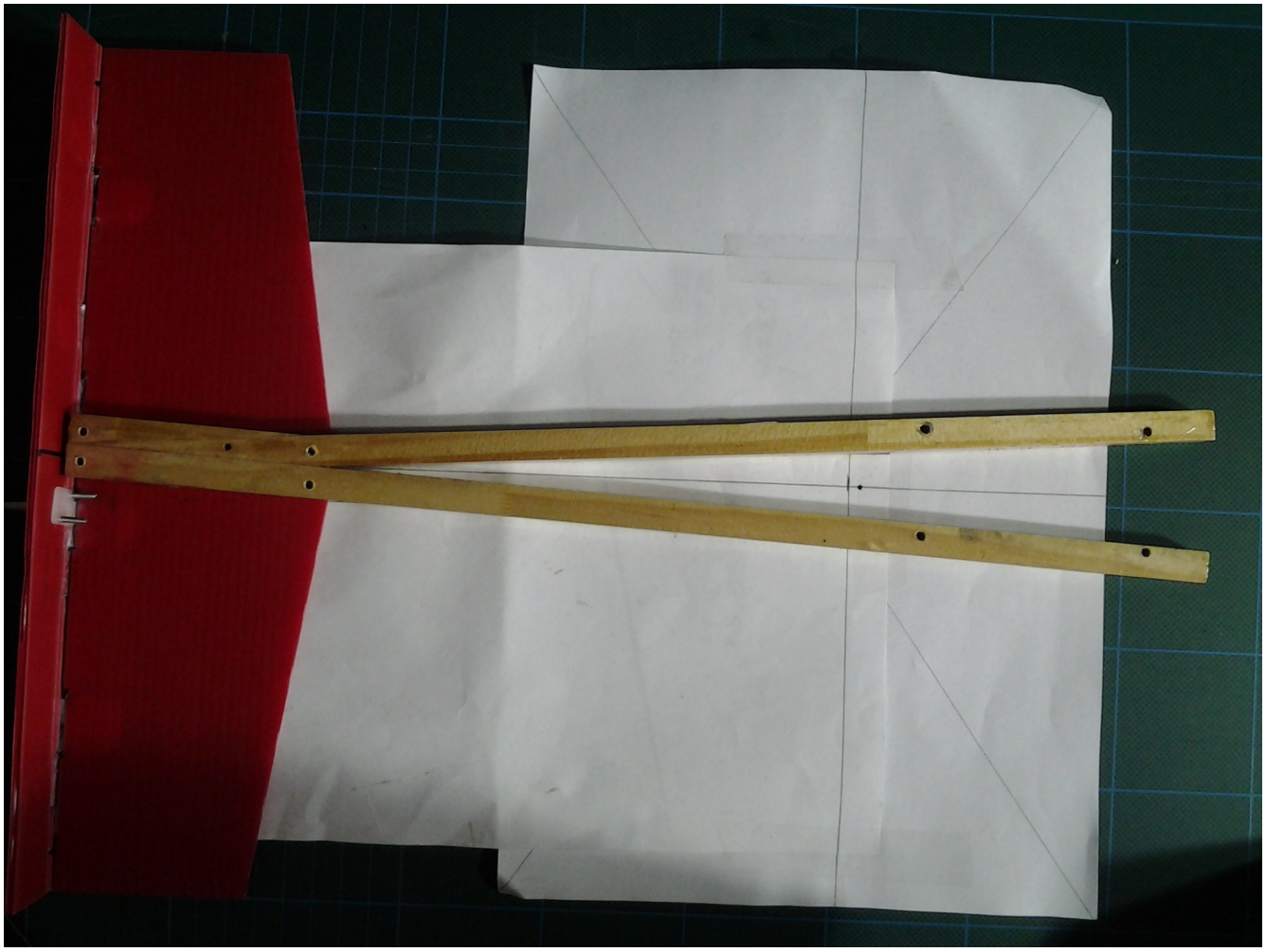

Figure 28: Crutch assembly over the plan with the tailplane in place

You can now use a nail (or something else with a point) to poke through the holes in the crutch and mark where to poke the holes through the tailplane. Bolt the fin, tailplane and crutch together.

Cut 6 squarish pieces off your 20mm aluminium strip and a drill 3mm (3.2mm if using 4-40 bolts) hole approximately in the centre of each one. These are used to spread the load where bolts go through the Corflute so that it isn't crushed.

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Assemble the wing, bearers and crutch as illustrated below.

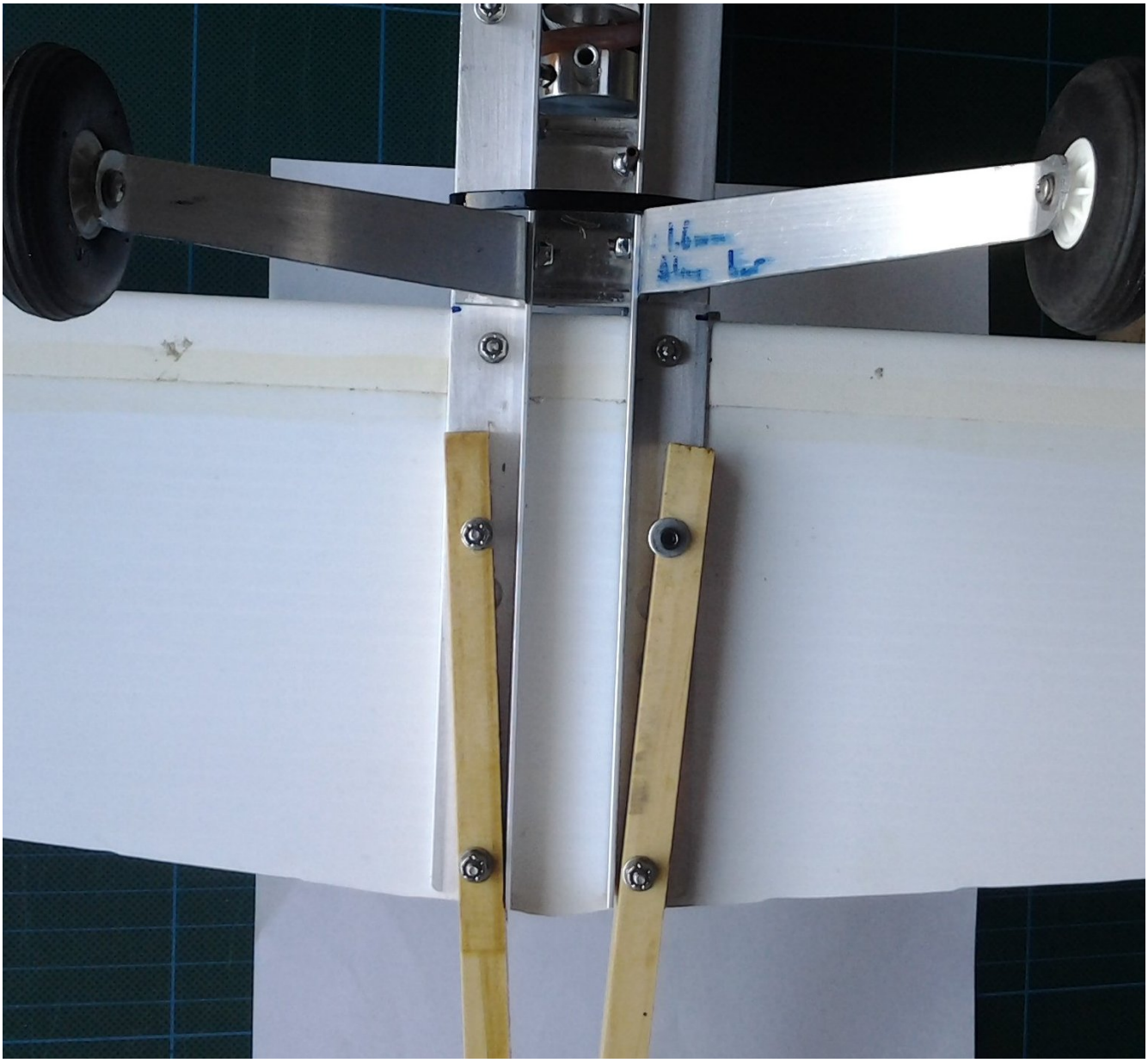

Figure 29: Attachment of wing, crutch and bearers

Fit the undercarriage. See Figure 16 Undercarriage fitted to finished model on page 22.

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Drill a hole in the crutch and attach the skid. You can make a simple clamp out of a small piece of the 0.5 mm aluminium strip about 1.5 cm long, and about 8mm wide. Bend a V in the approximately the centre and drill two holes either side.

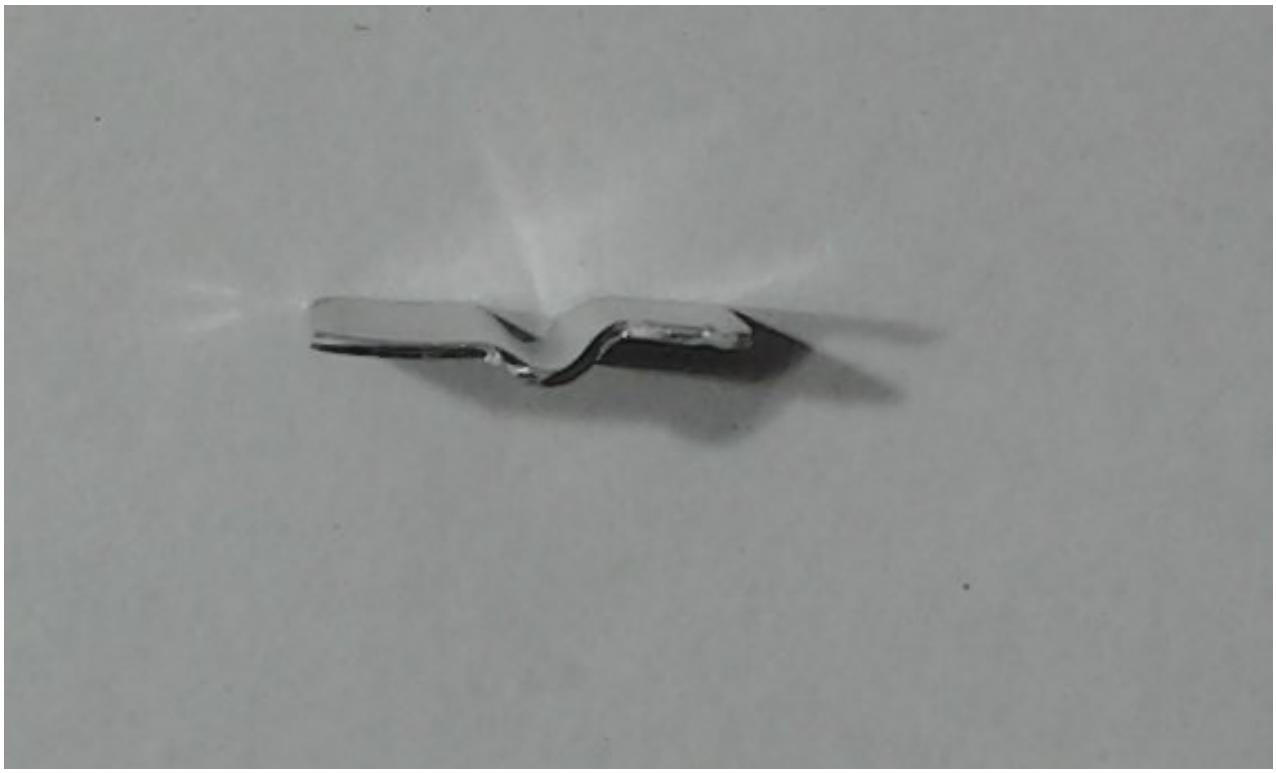

Figure 30: Clamp used to attach skid to fuselage

Attach the skid and clamp onto the fuselage using small wood screws.

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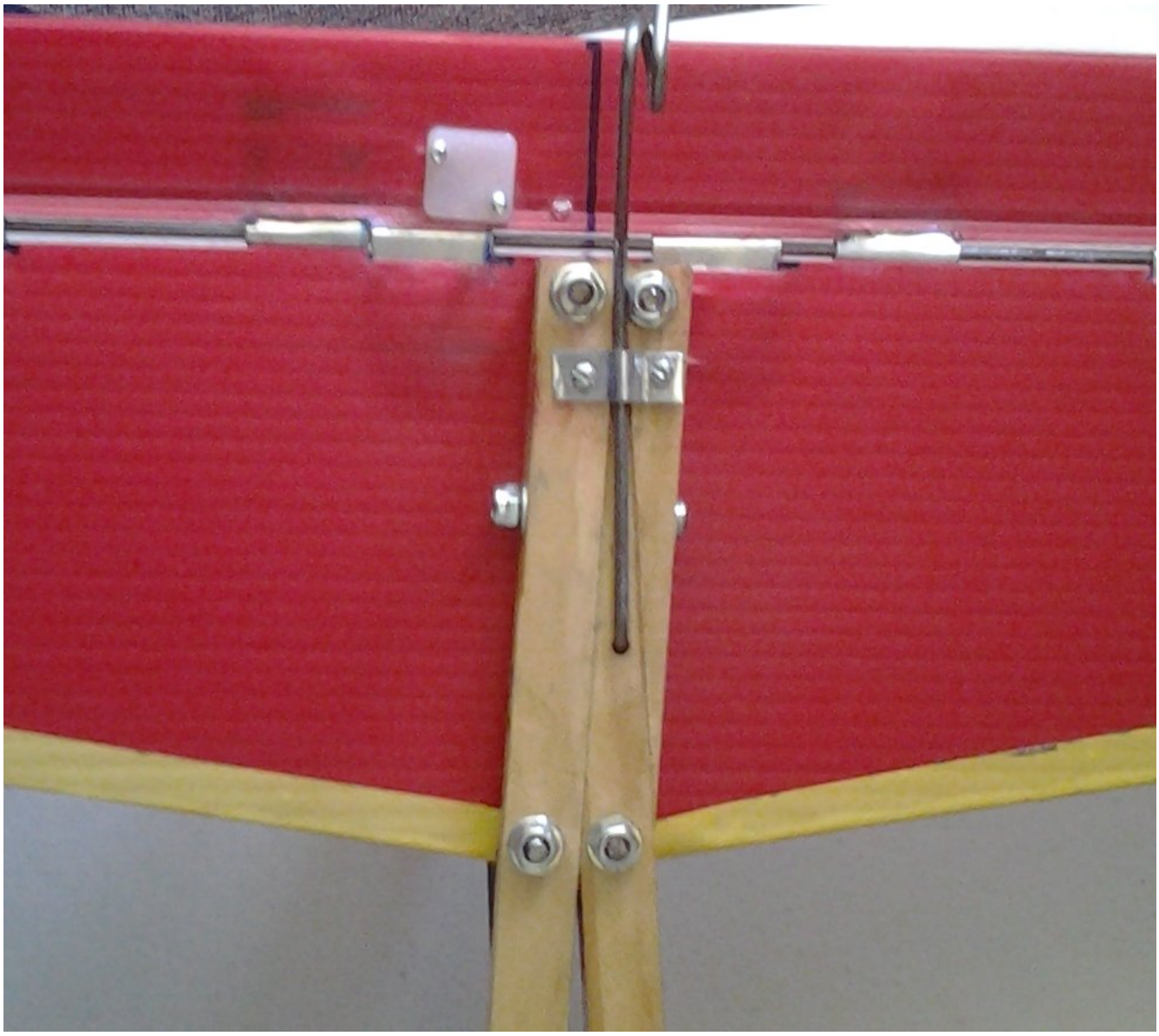

Figure 31: Skid attachment

At this point you are ready to make the wing tip ends of the leadouts. The control rod should now be connected from the bellcrank to the elevator, if you haven't done it already. The bellcrank should be in a neutral position when the elevator is level. That is an imaginary line joining the leadout holes is parallel to the centreline of the fuselage as viewed from above. If it isn't there a several ways of fixing it. If you are using an adjustable clevis then you can simply lengthen or shorten the pushrod by adjusting the clevis.

Alternatively, you can cut the pushrod and remove a small length (a couple of mm if too long), and solder a piece of brass tube over the join. See below

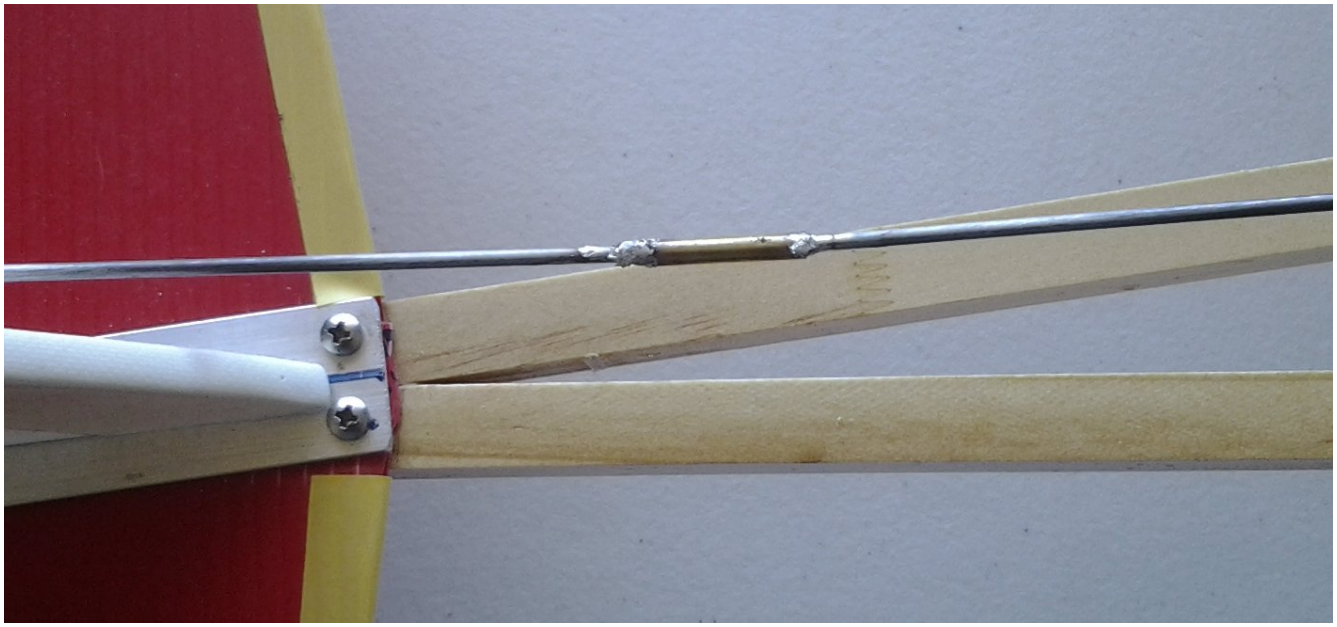

Figure 32: Small sleeve used to adjust the length of the pushrod

Use ether a lock nut or some Lockweld (or possibly cyanoacrylate glue) if using the nut supplied with the bellcrank. This should prevent engine vibration from loosening it. Be careful not to get glue into bellcrank pivot.

Clamp the elevator in the neural position with a foldback clip. Note the use of a couple of pieces of scrap balsa (or something else you have to hand) to stop the clip from crushing the Corflute. Slip the crimp onto the leadout such that the crimp is at least 3cm but no more than 4cm from the leadout guide. Make up the leadouts as per the leadout kit guide.

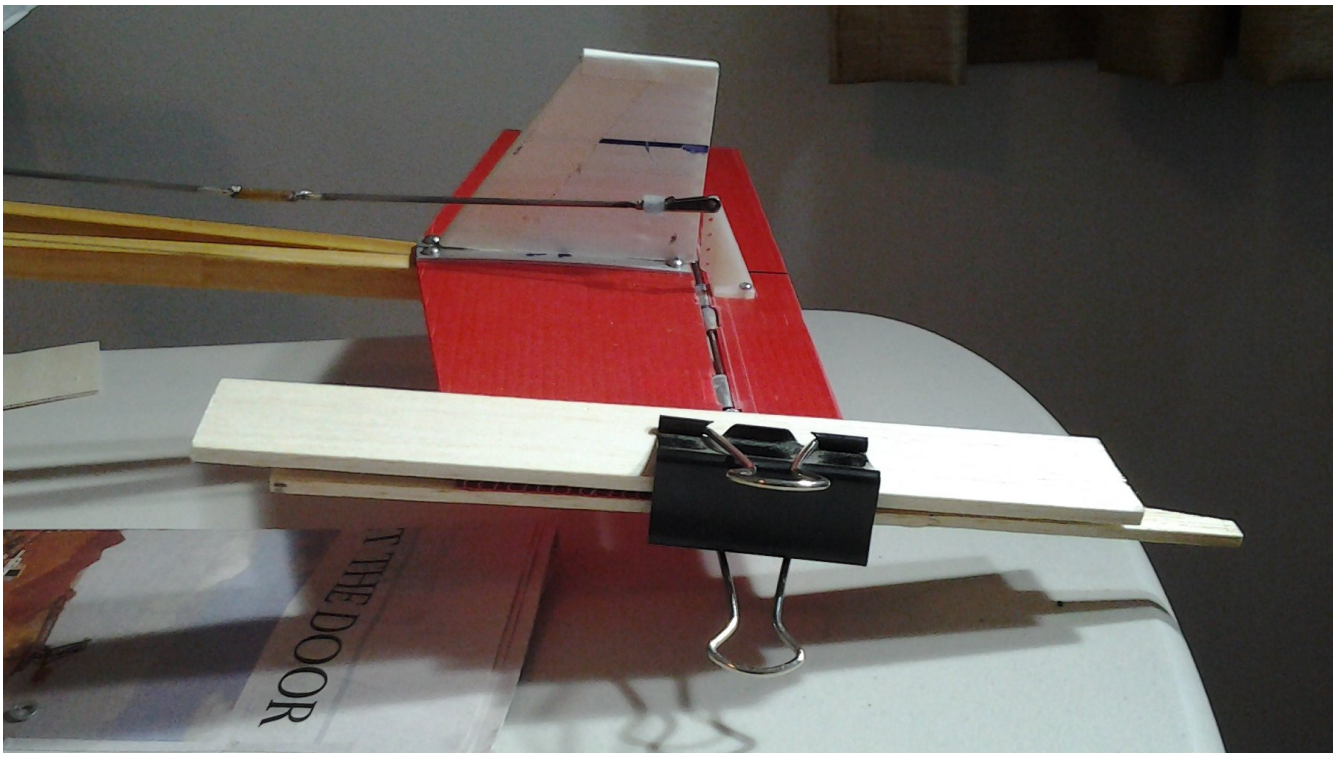

Figure 33: Holding the elevator in neutral whilst making the leadouts

Generally commercial metal fuel tanks are well made but you should check for leaks before fitting one to the model. Do this by blocking off two of the vents, attach a length of fuel tube the remaining and submerging it in a bowl of water. Blow gently into the fuel tube. Leaks will appear as a stream of bubbles. Apply solder to fix the leaks if necessary. Fit the tank by lashing it to the bearers as illustrated in Figure 16 (Bellcrank and tank final assembly) on page 22. Note the wedge points to the outside of the flying circle. The centre line of the tank should be at approximately the same level as the engine's needle valve, you may need to put some packing underneath the tank.

Drill a 6mm hole about 25mm from the leading edge near the outboard tip and attach a couple of large washers for a tip weight.

Decorate if you wish. Polyurethane paint should be fuel proof but don't forget that paint adds weight and this model is already quite heavy, the prototype is 800g.

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6 Flying

6.1 Preparation

The balance point should be in front of the bell crank mounting point, about 25mm back from the leading edge. Forward of that will be OK but further to the rear will make the model difficult to control.

If the model needs more weight in the nose consider moving the engine forward rather than making the whole model heavier with weights on the nose. Any weights added will need to be securely fixed. As you can see from the photographs of the finished model I've bolted some washers to the front of the engine bearers. Be aware though that moving the engine forward could make the venturi and needle valve more prone to damage in the event of a crash. The idea behind the short distance between the end of the bearers and the propeller is to reduce the likelihood of the engine penetrating the ground in the event of a crash (assuming you are flying over grass).

Push the model across a smooth surface. It should track in a straight line. If it has a tendency to turn to the left, as viewed from behind, then the model may turn in on you during take off which is highly undesirable. Adjust the undercarriage to remove the tendency.

If this is your first C/L airplane then welcome to the unique world of Control Line flying.

I suggest you join a club where you'll find lots of useful advice particularly with regard to setting up and care of your lines, the safe operation and flying your model and help if you are new to the operation of model aircraft engines. You may also be able to get a suitable second hand engine.

Which ever tank type you've chosen don't fill it completely for your first flights, about 3 minutes flying time is plenty initially. If you've chosen a wedge style tank then you'll have to fill it to at least ½ full to cover the feed pipe. I suggest you make sure your model is secure and run a full tank of fuel through the engine to give you an idea how long it lasts. 1 ¼ oz (about 38cc) of fuel will last about 4-5 minutes with a 2.5cc glow engine, longer with a smaller engine. If you do ground run with a traditional wedge style tank then the engine will stop once the fuel level goes below feed pipe and you'll have used approximately half of the fuel. This might seem odd but given the forces on a control line model in flight a wedge tank is designed to deliver all of its fuel whilst the model is flying in circle, not on the ground. In a clunk tank the fuel pick up follows the fuel around whatever the model is doing. The prototype used the

Brodak tank part no. BH-473 and the duration of the engine run was more than adequate when used with an A.P. Hornet or an Enya 15 on the same tank.

Fly on 50 – 55 ft lines (about 15 to 16.5 metres). The model was initially flown on 50 foot lines. Longer lines could be used on calm days. These lines are also likely to be useful for other small to medium sized models (1.5 to 3.5cc engines) too.

Inspect your lines every flying session making sure there are no kinks in them and pay attention to line ends where lines can break where they go through the crimp (if you use crimps). Every flying session I check the line ends with a magnifying class looking for broken wires (multi-strand). I recommend you use a wrist strap on your handle.

At the time of writing you can find flying instructions here.

http://www.mat.uc.pt/~pedro/ncientificos/f2/CLfaq.html

6.2 Flying Characteristics

You should find the model is docile but responsive. It can be a bit ‘soggy’ if the engine is underperforming I.e. set too rich. Once the engine has cut you’ll find the model doesn’t glide very far so you don’t want to be too high when the engine starts to splutter as the fuel is exhausted.

It was well received by other club members who flew it after its maiden flight.

7 Conclusion

I’d be interested in your building and flying experience with this model so that I can at least improve these instructions. Send an email to tonycavanna@gmail.com. At the time of writing I don’t know if I’ll be producing another version. I intend to move on to producing a stunt trainer.

And now a shameless plug: I fly at LARCS (larcs.com.au) which is one of the best model flying facilities in Australia for the reasons described on the website. In the Control Line section you’ll find a friendly group of people who will be only too glad to help.

Corflute Control Line Trainer

Appendix A. Suppliers

In Australia

- **Wights Model Aircraft:** Supplier of Control Line models, engines and accessories: www.wightsmodelaircraft.com.au
- Your local model/hobby shop

International Suppliers

- **Brodak:** Supplier of Control Line kits, engines, accessories: brodak.com
- **Sullivan:** Supplier of Aermodelling parts, small selection of C/L accessories: sullivanproducts.com
- **Du-Bro:** Extensive range of tools and accessories for modellers. Most model shops stock their items: dubro.com
- **Just Engines:** Just engines as it says in the name. They will supply their smaller ASP engines, up about 12cc, with a control line venturi: justengines.co.uk
- **Enya:** enya-engine.com
- **Ebay:** Can be useful source for engines, new and second-hand, but it is a case of buyer beware. If you do choose this as a source look for the following characteristics: It should be relatively clean and damage free i.e. no broken lugs or chipped fins. Make sure the engine has a prop nut, prop washer, thrust washer, venturi, spray bar and needle valve; these are items that are relatively easy to loose. The one thing you can't see via eBay is the engine's compression. Low compression will make the engine difficult if not impossible to start and if it runs it will lack power. Many older engines do not have mufflers (silencers) which may be required where you intend to fly. Older glow engines (before 1980s) also generally need a fuel that contains about 25% castor oil. Most fuel available at hobby shops these days only has 20% synthetic oil.

Appendix B. Leadouts

Loop the leadout wire through the bellcrank and the crimping sleeve.

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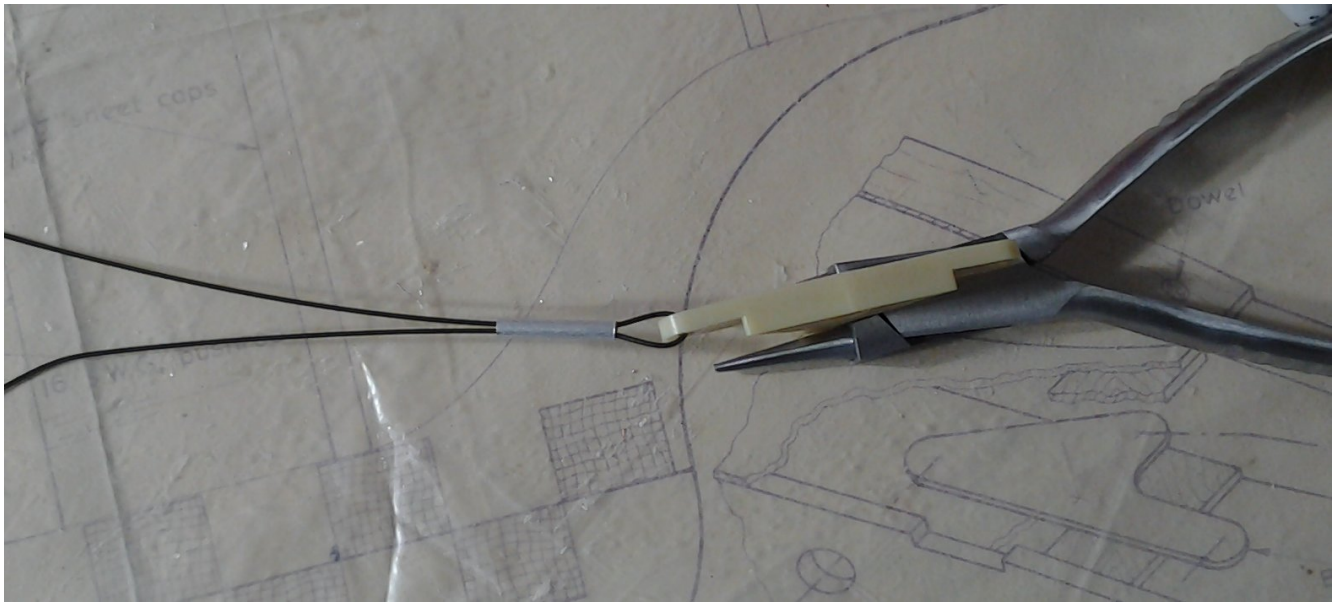

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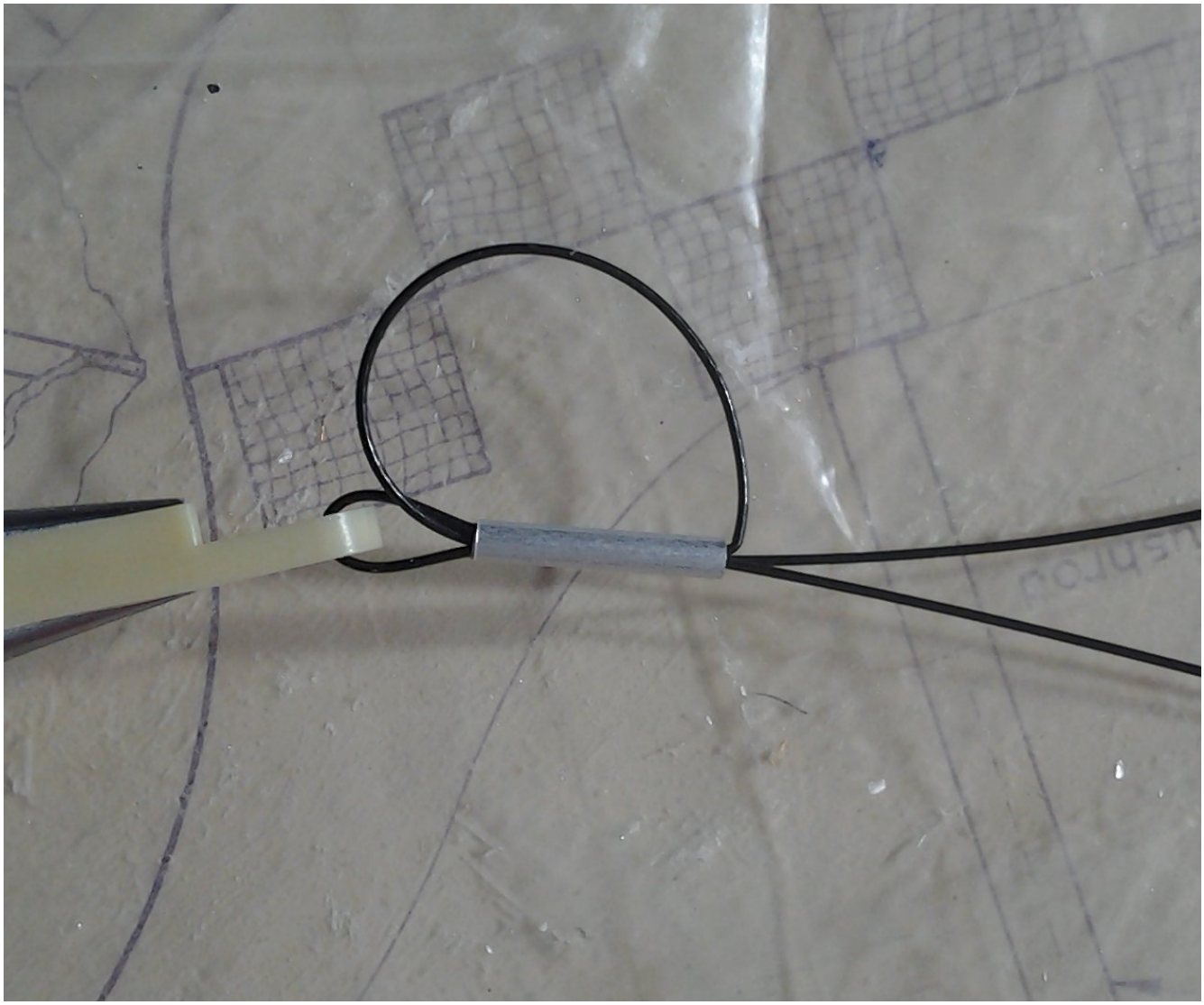

Loop the free end back through the sleeve. Note the 90 degree bend which makes it easier to pull the free end through the sleeve. Pull the free end tight so that there's only a small loop outside of the sleeve.

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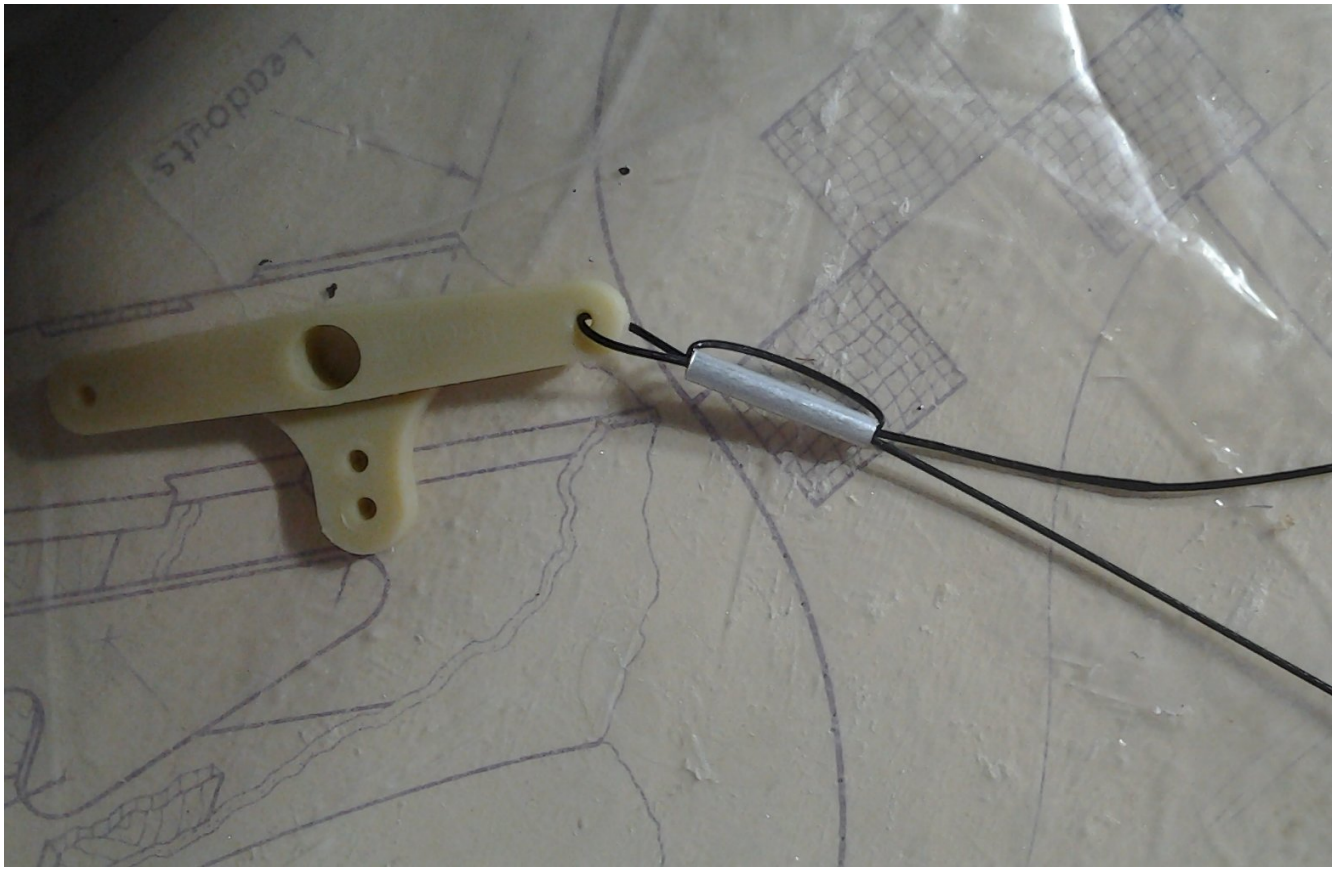

Crimp the sleeve in at least 2 places and trim the excess from the free end (not shown). See also Figure 16 Bellcrank and tank final assembly.

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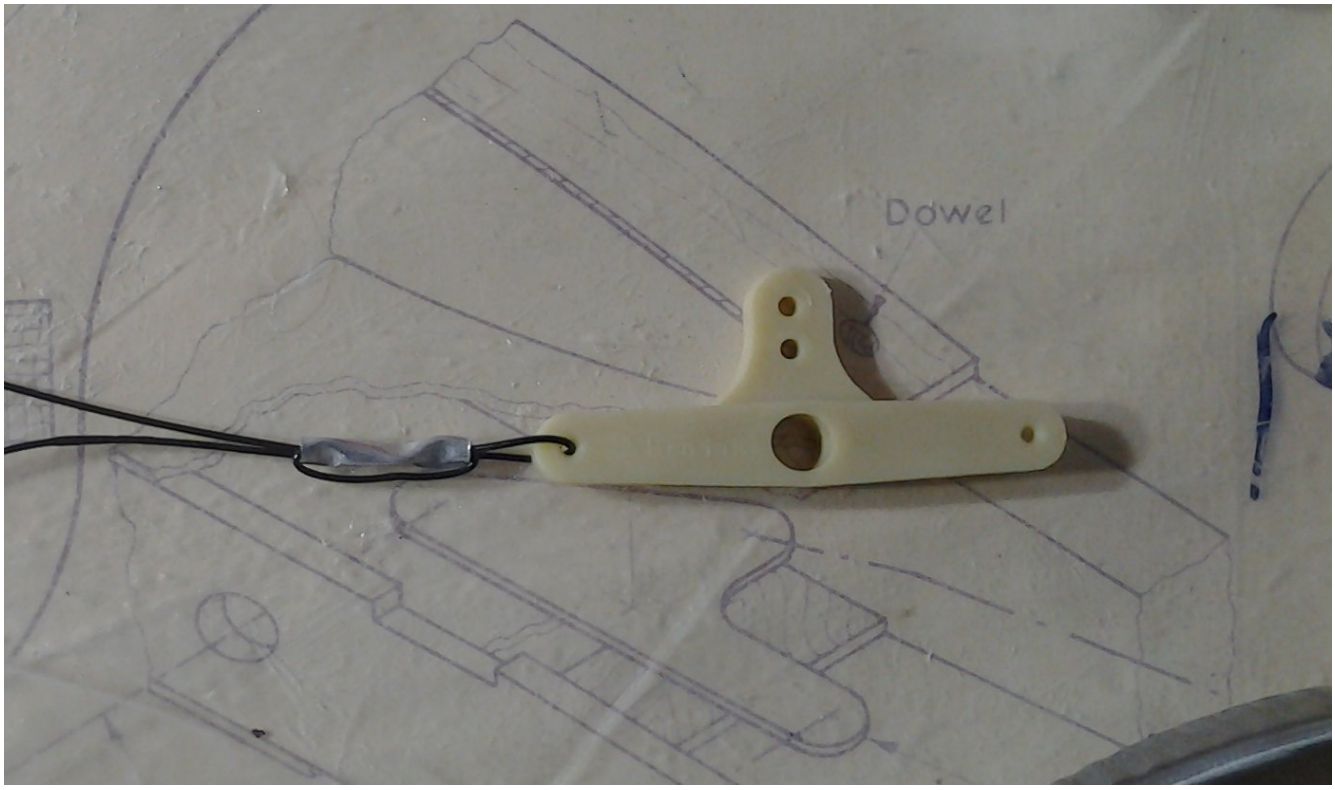

At the other end making of the leadout the process is very similar. I've used a thin copper tube bent around a small screw driver to make the leadout ends. The leadout wire needs to be inserted into the tube before bending. The crimping is as described for attaching the leadout to the bell crank.

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