

By Dave Greenfield  
Photos By Terry Hall

IMAGINE A TINY SINGLE CHANNEL MODEL THAT WILL PERFORM LIKE THE BIG ONES. TRY THIS LITTLE .049 DELTA AND SEE FOR YOURSELF.

PELTA



#### ABOUT THE AUTHOR

Dave Greenfield, age 46, lives with his wife in Leeds, England. He is a University lecturer in the Technology Department.

Dave has been building models for the best part of 40 years. He began designing about 1944 and has been modeling 'seriously' for well over 30 years. He started flying radio control about 16 years ago and is involved in all facets of modeling from T.V. film demonstration models to model engineering. Dave has a special interest in unorthodox aircraft and exploring non-traditional materials and techniques, although he still gets a lot of pleasure from rubber jobs and hand launch gliders.

I haven't been so excited about a single channel model since I first started flying radio 16 years ago. Perhaps when I think back to the beginning of my single channel days I was pretty excited if the air was nice and calm and the model flew around for 5 minutes or so and landed within walking distance. A peep at the tube showed that it was still glowing, which meant we could risk another flight.

But never in our wildest dreams did we imagine a tiny single channel model that could perform like the big boys. Having said that I don't know where to start, so I'll tell you a story.

A friend of mine, John, a keen slope soaring enthusiast, who had cut his teeth on the latest sophisticated gear and who had never experienced the thrill of single channel flying, asked for a demonstration. So, one day on the way back from a slope soaring session (yes, I do that too!) we dropped off at the tiny field near my place to run Pelta through its paces.

Conditions were not exactly 'millpond' as we had just had out on the slopes. But with the high thrust line and low center of drag, Pelta keeps its nose down in quite strong winds. Even with a tired old .049 diesel it is quite flyable in 20 knot winds if you feel like taking her out in that kind of weather.

Anyway, after a nice steady launch and a hedge-high circle of the field we went for altitude. A couple of seconds of aileron held full on produces a spiral dive which is the

#### PELTA Designed By : Dave Greenfield

##### TYPE AIRCRAFT

1/2A Aerobatic Delta

##### WINGSPAN

29 Inches

##### WING CHORD

Root 13 1/2"

Tip 5 1/2"

##### TOTAL WING AREA

260 Square Inches

##### WING LOCATION

Mid Wing

##### AIRFOIL

Flat Bottom

##### WING PLATFORM

Swept Back - Double Taper

##### DIHEDRAL, EACH TIP

None

##### OVERALL FUSELAGE LENGTH

21 Inches

##### RADIO COMPARTMENT AREA

(L)9" x (W)1 3/4" x (H)2 1/2"

##### STABILIZER SPAN

NA

##### STABILIZER CHORD

NA

##### STABILIZER AREA

NA

##### STAB AIRFOIL SECTION

NA

##### STABILIZER LOCATION

NA

##### VERTICAL FIN HEIGHT

2 1/2 Inches

##### VERTICAL FIN WIDTH

5" Average

##### REC. ENGINE SIZE

.049-.051

##### FUEL TANK SIZE

1/2-1 Oz.

##### LANDING GEAR

None

##### REC. NO. OF CHANNELS

1

##### CONTROL FUNCTIONS

Ailerons

##### BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Balsa and Ply
Vertical Fin	Balsa & Ply
Wt. Ready-To-Fly	19-21 Oz.
Wing Loading	10.6-11.7 Oz./Sq. Ft.

closest thing to a vertical spin that you could imagine. I showed John how this was done to produce a big open loop when the control was neutralized. He didn't seem too impressed, pointing out that any mug can loop the loop. However, I was quite pleased because I have never before had a model that will fly satisfactorily in high winds and loop on the same trim. At the bottom of the loop John was praying for a bit of down elevator (which we haven't got!) to level things out. But as soon as the nose poked itself up a bit, and John was expecting a wallowing stall, I gave it full aileron to produce a roll as quick as you can blink, which killed the excess speed for Pelta to settle down into a well-behaved straight and level flight path.

To cut a long story short we really put Pelta through her paces. You name it and Pelta will do it. She is quite happy with anything from stall turns to axial rolls, although what I swore were vertical rolls, John swore weren't anything.

But all the rolls were a delight, whether axial or barrel or just plain out of the top of the loop. Perhaps this is because the deep fuselage provides a large lateral area which seems to eliminate, or at least minimize, yaw. And with a large proportion of the lateral area in front of the C.G. there is little tendency (common in single channel deltas) to slip in or out of steeply banked turns.

When the fuel ran out we lined Pelta up, dropped it in over the hedge and stepped back a pace or two as she slithered in along the grass. While I cleaned off (with the corner of a postage stamp) the two drops of sludge that hadn't actually blown clear (lovely place for an engine), John asked me

why I couldn't land my soarer like that. I ignored the remark, trying to hide the "too self satisfied" grin and filled up the whole 7/8cc of tank again, ready for the next session.

I was a little hurt that he thought the vertical rolls were a bit on the poor side. Those of us who like to get 'the most out of the least' by flying single channel models will know how I feel. One day I might get round to telling him what it was like in the dark and distant 'tube age.' By the way, he is waiting for the two channel version to come out so that he can have a go—especially since we have subsequently flown Pelta on the slopes and we like the way it performs there, too.

### CONSTRUCTION

Because this is a one piece model it is best to start off by building the wing and adding the rest. If you cover with nylon it is advisable to do so before any of the other components are fixed to the wing. However, there is little advantage in covering Pelta in nylon because the structure is quite rigid and tissue covering survives even the most severe treatment the model is likely to undergo.

#### Wing:

(1) **Foam Wing:** This can be made from foam and 1/16" balsa as shown in the photo. I actually sand the two panels to shape, separately, having first glued the underneath sheet leading and trailing edges, the root and tip ribs, and the 1/8" square balsa leading edge in place (all with aliphatic type glue) before I start, not forgetting the bottom capstrips. Each rib is then divided into fourths and has vertical lines drawn on at each division. Now I have all the reference points needed to generate the form, provided a straight-edge is used to check the line from root to tip. The foam is sawn roughly to shape with a bread knife and a long sanding block with not-too-new sandpaper securely fixed to it is used to remove the rest of the foam.

Next I glue both halves together at the root, and then add the bottom center sheeting.

Make a fairly shallow groove for the antenna tube and then cut off the apex (or 'front point'). Cap the exposed foam at the apex with balsa. This cap has a hole in it for the tube to pass through, and is sanded to match the form of the wing.

It is generally a good idea to glue a strip of balsa over the antenna after the tube has been inserted and before the leading edge sheet is added.

Finish the wing by adding all the top balsa sheeting and capstrips and, finally, the leading edge strips. Sand off all joints smooth. Note: If the foam is covered with 1/16" sheet completely, the wing will last forever — or almost forever.

(2) **Built Up Wing:** Personally, I prefer this structure as it weighs 1 ounce to 1½ ounces less than the foam wing. In other words the foam version can weigh up to 50% more.

Before you start (and the same should be said for the foam wing) make a note of the

direction of rotation of the engine you intend using. This seems a strange thing to do at this stage, so I'd better explain why. If, when viewing the model from the rear, the prop turns clockwise, the engine should be mounted to the left and the antenna should extend from the right wingtip. For counter-clockwise rotation the engine mounting and engine position should be reversed along with the antenna location.

The reason for this is that in powered flight the drag from the antenna counters the turning force of the torque reaction, and so no engine offset is required. And, on the glide, the drag from the antenna (which is less than under power) opposes the turning effect of the imbalance caused by a side wound engine, and so the glide is straight.

So, you can see that the position of the antenna housing tube in the wing depends on the direction of rotation of the motor. On the other hand, if you do not stick to this configuration it is not the end of the world. It just means that different trim may be needed for power and for glide. That's my experience anyway, and if the model is flown with rubber driven escapement, like

Pelta Mk I (slightly modified), you haven't the luxury of in-flight trim.

Now let's get down to building the wing.

(1) Cut the bottom 1/16" sheet leading edges and shape them together, ensuring the correct sweep back angle.

(2) On a flat surface, pin the leading edge sheets and trailing edge sheets in place over the plan sheet. Pin and glue the 1/16" tip sheeting, the 1/16" center section sheeting, and lower capstrips in place.

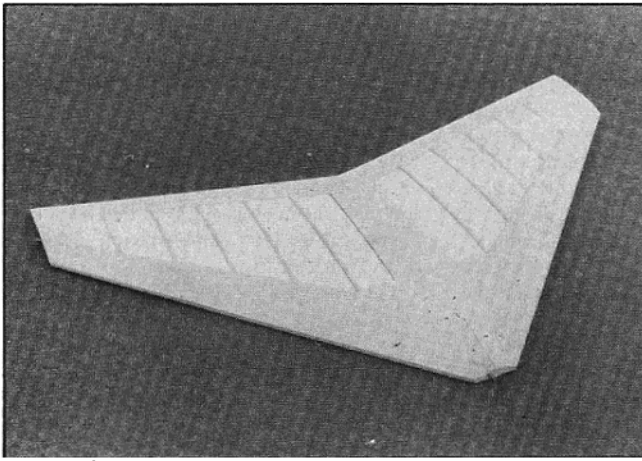
(3) Glue the 1/8" square leading edge strips and 1/8" square bottom main spar in place.

(4) Cut out the wing ribs, using the outlines shown on the plans. Do not cut the spar notches at this time. Drill the antenna tube holes in the appropriate wing ribs.

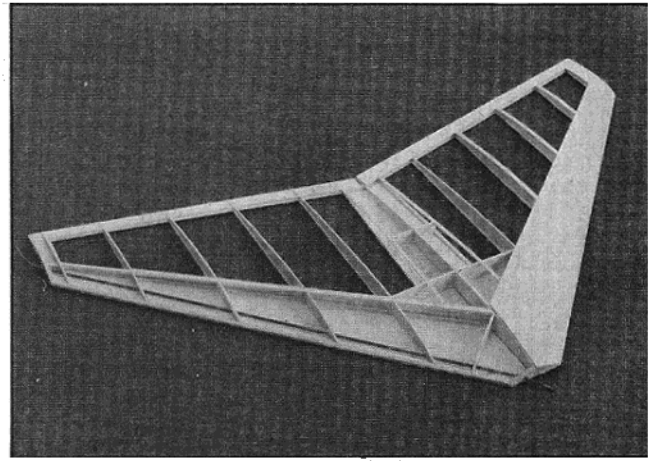
(5) Place each rib in its proper position over the bottom 1/8" sq. main spar and mark the location and angle of the hatch. Cut the notches and glue the ribs in place.

(6) When dry, draw vertical lines on each rib from the bottom main spar, to give the position of the 1/8" square top main spar. Notch the ribs to accept this spar and glue the 1/8" square top main spar in place.

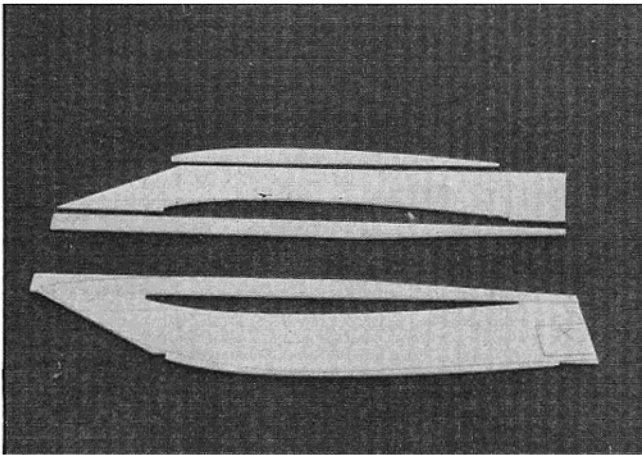




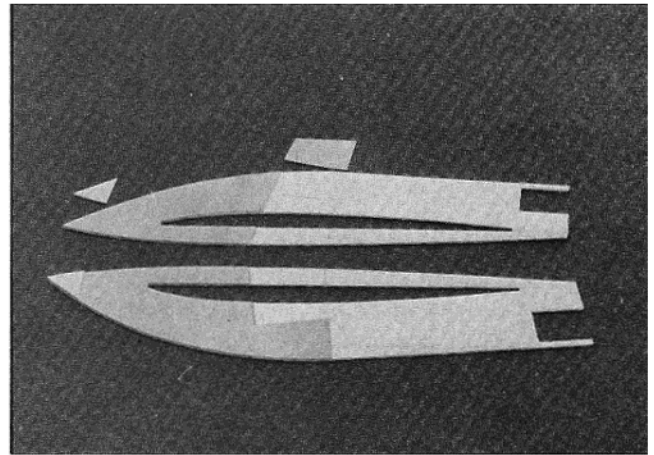
Completed foam wing with 1/16" balsa sheeting and cap strips.



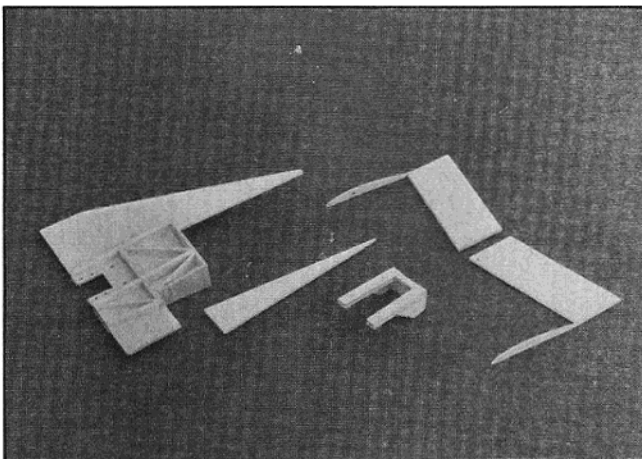
Partially completed built up wing weighs 1 to 1 1/2 ounces less than foam.



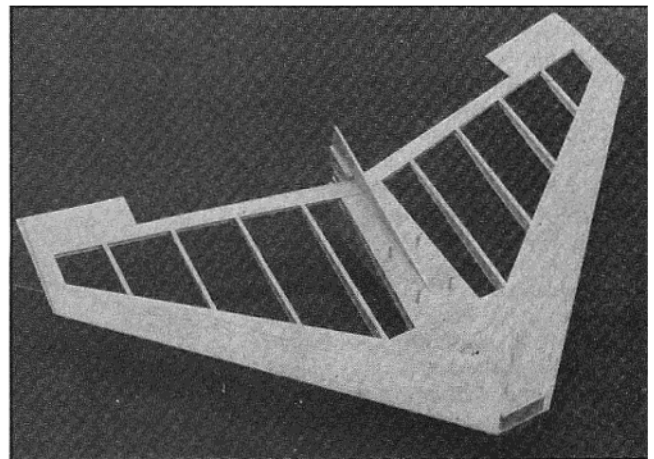
Basic fuselage sides ready for trimming.



Fuselage sides trimmed and doublers added.



Fin with engine mount and wing reflex plates awaiting installation.



Bottom of wing with fin attached. Note 1/8" dowels for aligning fuselage.

Notice that it butts against the rib adjacent to the tip rib (W6).

(7) Fit and glue the 1/16" balsa shear webs in-between the main spars, trailing edge sheeting and ribs. The center section webs (stub spars) are fitted after the 1/16" x 1/8" stiffeners are glued to the bottom center section sheeting. The aileron hinge anchor points should be fitted and glued in place at this stage.

(8) Glue the plastic antenna tube in place.

(9) Make sure all the joints are flush and the 1/8" square leading edge is shaped to continue the contour of the ribs and apex cap-piece.

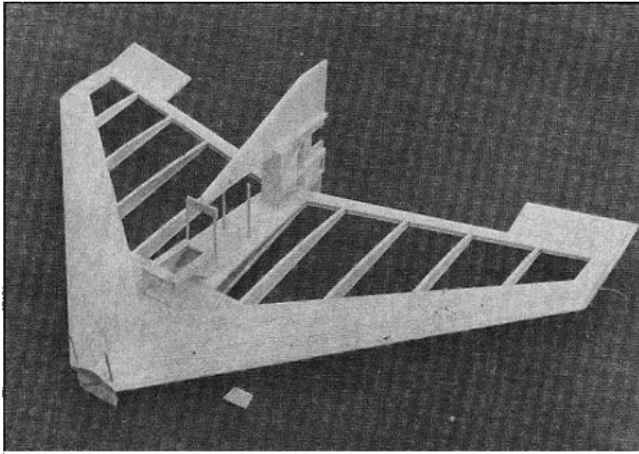
(10) Add the top leading edge and trailing edge sheet. Next come the top center section 1/16" x 1/8" stiffeners, followed by the center section sheeting and capstrips. Notice that it may be necessary to score the center section sheet on the center line to help it take up its proper contour, especially fore

and aft.

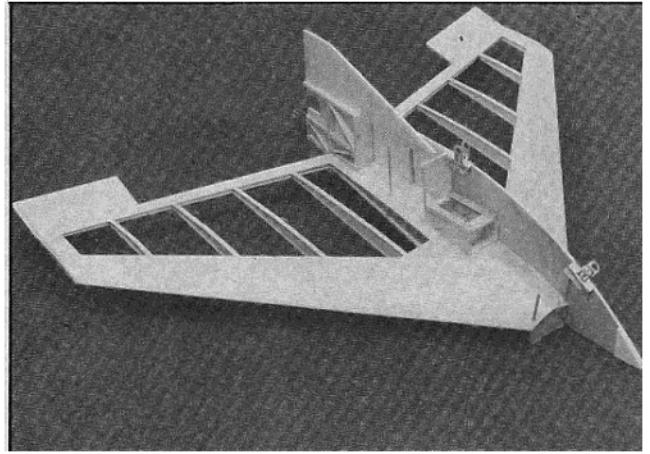
(11) Finish the wing by adding the capping to the outer two ribs (grain span-wise) and then fixing and shaping the leading edge strip (which may be a hardwood if you like). Sand off all joints flush.

#### Fixed Reflex Plates:

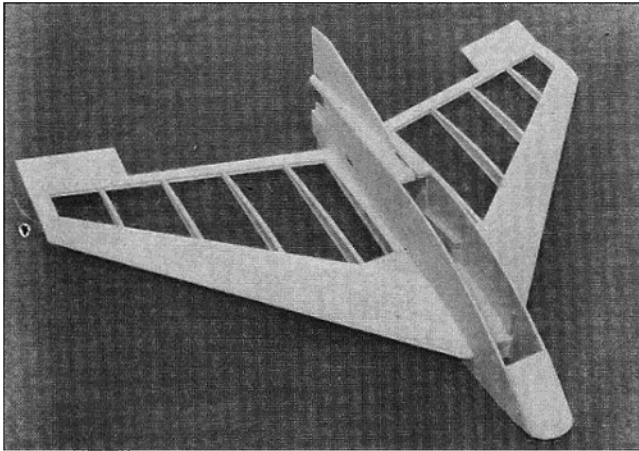
Although part of the wing, these are important enough to get a section of their own. They must be identical in shape, area



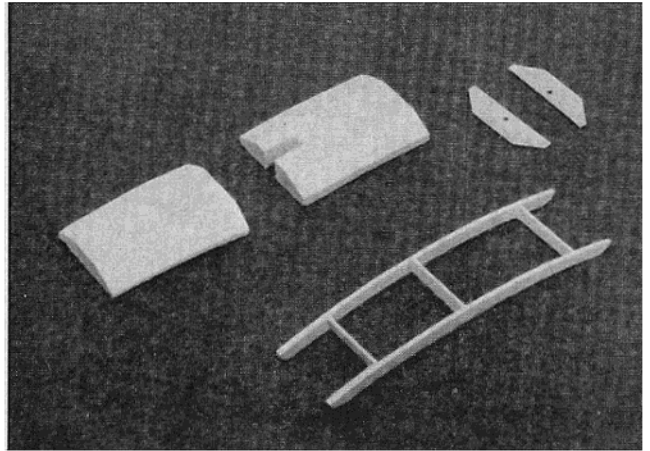
*Top of wing with fin and dowels in place.*



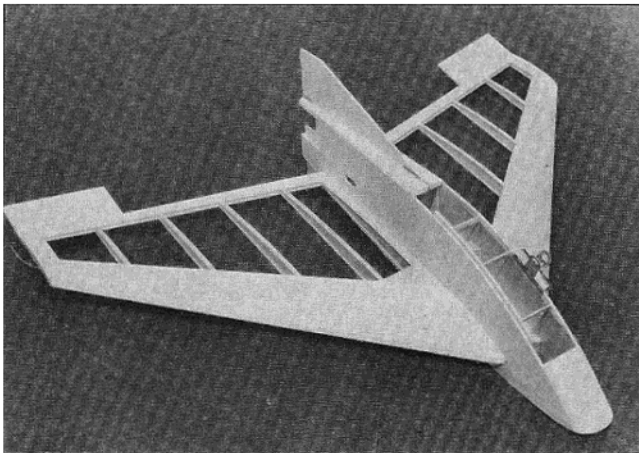
*Top view showing one fuselage side in place. Note aligning dowels.*



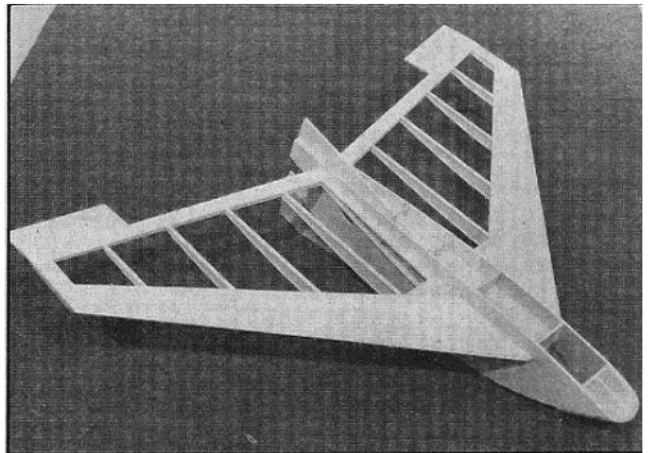
*Basic fuselage nearing completion.*



*Hatch and hatch frame ready for installation.*



*Hatch frame being installed.*



*Bottom view of Pelta ready to be sheeted.*

and angle of reflex.

(1) Cut two identical plates and sand them to shape together.

(2) Glue 1/32" ply caps to the inboard end grain and sand off flush when dry.

(3) Round off the trailing edge of each plate and bevel the leading edge which butts neatly against the trailing edge of the wing.

(4) Make (as a pair) two identical 1/32" ply 'reflex keepers.' Glue each one to its corresponding reflex plate, absolutely flush

at the bottom. Before the joints have set, place them 'nose to nose' on a flat surface to see if the angles are accurate and then double check by placing them side by side. Notice one has a hole to allow the antenna tube to pass through.

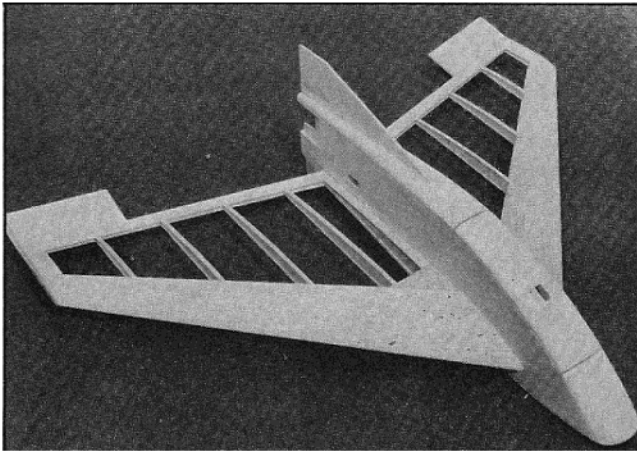
(5) Glue them to the wing and support them with 1/4" balsa while they dry. Do not glue the 1/16" ply tip plates in place until the model is covered.

**Engine Mount - Fin Assembly:**

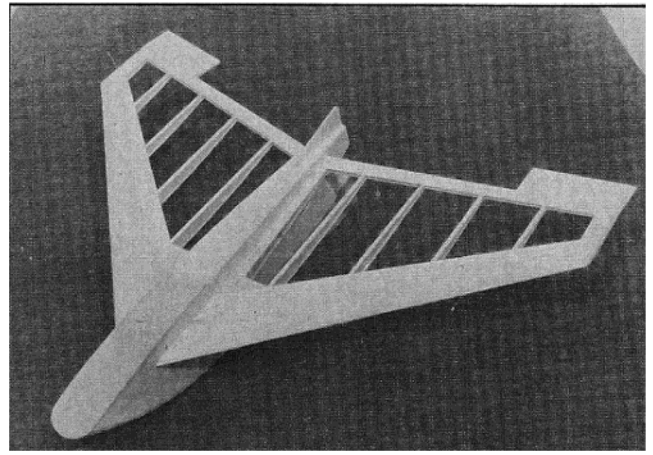
This is quite straightforward. The main point to note is that the angle it sits on the wing determines the thrust line of the engine. It is a good idea to add only a few components at a time and sand them off flush when they dry. This means that waiting time is considerable. I actually start on this part first and keep coming back to it periodically.

**Servo Tray and Mount:**

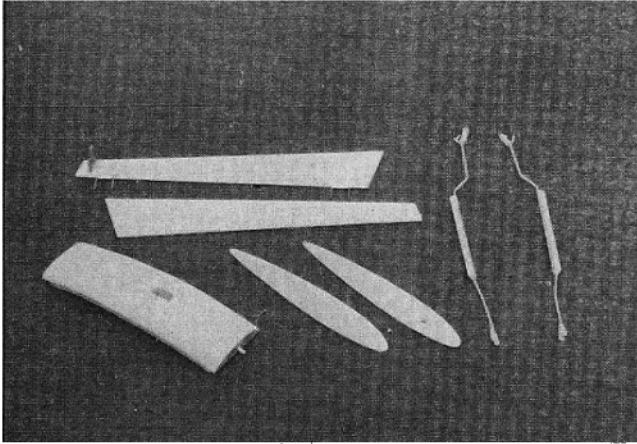
(1) Make up a ply tray to suit your servo



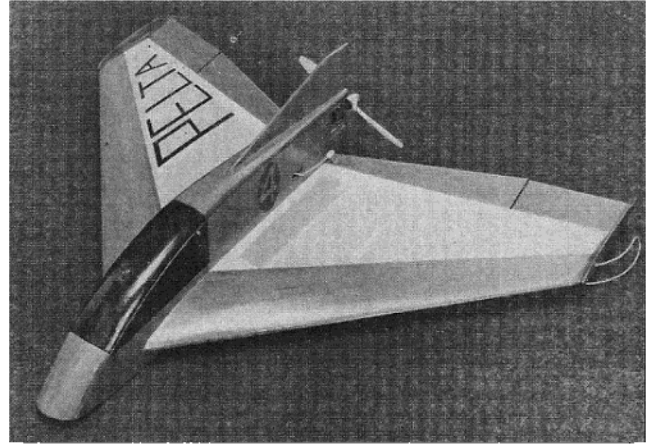
Top view of completed airframe.



Bottom view of completed airframe



Hatch, ailerons, tip plates and pushrods ready to be installed.



Completed Pelta ready to fly. Prototype used a diesel. Note receiver switch in hatch cover.

(notice the taper).

(2) Fabricate sections (from 1/32" ply and hard 1/8" square balsa) to support the servo tray cross pieces. Join them with a 1/8" sheet balsa brace.

(3) Add the rear servo mount 'legs' only at this stage and tie them together with 1/16" balsa plate at the back.

#### Fitting Components to Wing:

When all the components mentioned so far have been made they can be fitted to the wing center section, together with the 1/8" diameter dowels and balsa spacers between them.

(1) Glue the engine mount and fin assembly securely in place.

(2) Glue the servo mount in place. When dry, cut and fit the 'front legs.'

(3) Take a flexible strip of wood (e.g., 1/4" square balsa) and clip it to the fin assembly and servo mount legs. Pencil onto the balsa center section the curve generated by the strip, and extend the line to the apex cap. Do this for both sides, and this gives the position of the fuselage sides.

(4) The 1/8" diameter dowels are now fitted. This may be quite novel, so I'll give a detailed explanation of how it is done. A small round needle or swiss file of 1/8" diameter is a very useful tool for this process.

Start by making the holes adjacent to the servo mount.

- Pierce a hole tangential to the pencil line and the servo mount back plate.
- Screw the file into the balsa until it meets the bottom sheeting.
- From the front, sight along the side of the servo mount and the front edge of the fin assembly and line the file up with these reference points.
- Pierce a hole in the bottom sheeting and, when satisfied that the needle file is vertical (front view) and parallel with the servo mount back plate (side view), complete screwing the file right through. As each hole is made, slip the corresponding piece of dowel in place and this provides more reference points for sighting when piercing the remaining holes.
- Cut the dowels to length and glue them in place.
- Tie the dowels together with balsa spacers, according to the plan. Notice that the front of the fin butts centrally against one of these spacers.

Now we have built the basic structure to which the fuselage is fixed. Remember to add the sub-fin at this stage.

#### Fuselage:

The fuselage sides come next. Cutting out

the slots in the fuselage sides so that they can slip onto the wing can be tricky; so we 'build the hole' rather than cut it. I find it a good idea to shape a piece of cardboard to the form of the top of the wing where it joins the fuselage. This takes some time but is well worth it if you want a good snug fit. And the bonus is that you have already prepared a pattern for cutting the covering material.

Making the fuselage sides and fitting the doublers is quite self-explanatory from the photos. Notice that the joint at the rear is left unglued until you are really sure of the fit.

(2) Glue the fuselage sides in place and hold them in position with clamps and pins while drying.

(3) The bottom is covered with 1/32" ply and 1/16" balsa sheet as shown on the plan. The top is covered with 1/2" balsa at the nose and two pieces from 1/4" balsa either side of the fin. These parts are best pre-shaped before they are fixed to ensure that the fin is not damaged in the shaping process.

(4) The canopy is made up of 1/2" and 3/8" sheet balsa over a frame. The frame is actually built between the fuselage sides, the curved parts being pressed against the inside of the sides with spacers glued to them. Sand this frame to the exact curve of

the fuselage top. Remove it and then fit the 1/2" and 3/8" sheet balsa pieces which are then glued in place cross grain for easy bending.

When finished, the canopy is carved and sanded to a rounded cross section and this section is continued to the nose block. Drill small holes through the fuselage walls and continue them through the canopy frame. Enlarge them to accept the 1/8" diameter dowel, pressing the canopy firmly in position all the time.

Don't forget the securing dowel in the front of the canopy, and the 1/32" ply reinforcement plates attached to the nose block and front of the canopy itself.

#### Before Covering:

The model is now almost ready for covering, but there are some things we need to do first:

(1) Make the ailerons. These should, of course, be identical in shape and size. Cut them from stiff 1/8" balsa and add the 1/32" ply caps to each end. Round off the leading and trailing edges, going for a slightly triangular section inboard if you like.

(2) Fit the aileron horns. Hinge the ailerons in place (without gluing) locating the anchor points in the trailing edge of the wing from the plan. At this point they should be a firm fit but quite removable.

(3) Install the servo in its tray and mount it, along with the tray cross pieces.

(4) Cut the aileron pushrod exits in the fuselage sides and finish with 1/4" diameter round file or a cylinder of rolled up sandpaper. Notice that this can be done when the fuselage sides are being made, but doing it later (although a bit more difficult) ensures that you get them just right.

(5) Make up pushrods from strong 3/16" square balsa and wire. Fit the links to the wire.

(6) Slip the pushrods in through their exit holes and attach them to the servo and the aileron horns.

(7) Adjust the lengths of the pushrods so that the ailerons reflex at the same angle as the fixed reflex plates. This means that they are raised at least 1/4" at the outboard edges.

(8) Install the radio system and check that the ailerons and pushrods move freely.

(9) Disassemble and prepare the aircraft for covering.

#### Covering:

We all have our favorite methods of covering, however, you may be interested in some unusual techniques that I find useful. My Peltas are tissue covered all over. Usually I won't use anything but nylon, with a coat of tissue over that, but this little model is so robust that tissue is just fine. The only damage has been due to careless transport or handling. In fact, I have seen a Pelta that needed another 15' to complete a loop. With the nose buried up to the wing and the engine screaming its head off, one would expect a near write-off. So you can imagine how surprised we were to find nothing but a small dent about the size

of a match head in the nose — tissue intact.

Here are a few hints and tips:

(1) I can't stand working with dope — especially for long periods. So, for sealing the wood (and for applying the paper to sheet surfaces) I brush on a liberal coat of aliphatic type glue (white, water soluble) thinned down with an equal amount of water. The sealing coat is allowed to dry thoroughly first, and is rubbed down with fine sandpaper.

(2) To speed up the actual covering process the tissue is pre-cut — i.e., I make a 'tissue kit,' using newspaper templates or patterns where necessary so as to make neat overlaps and get things to the right shape and size.

(3) All tissue is applied damp. First of all soak it in water (float it in the bath) and spread it out, as you need it, onto a towel. When it is dry enough not to adhere to itself it is ready to be put in position, adjusted, if necessary, and then have the watered down glue solution brushed on. This soaks through the tissue and bonds it to the primed wood. A 1" paint brush is useful for this.

(4) After sealing the wood, cover the nose of the Pelta with nylon. Wrap the piece of nylon over the nose block and overlap the bottom with about a 1/8" margin. I fit the nylon wet and then cement it in place. Then the 'bandage' gets a coat of the thinned down aliphatic type glue.

(5) The open panels on the wing are covered with damp tissue. The fixing is done around the edges only (not the ribs) with dope (or sanding sealer if you like) brushed through the positioned paper. The paper can be tightened (while wet) by pulling it outwards around the edges with your thumb. Or you could use an old toothbrush instead of the thumb — a technique I always use with nylon covering.

(6) Cover the engine mounting tray with paper. It will eliminate fuel seepage.

(7) Cover the ailerons before hinging them in place.

(8) Cover the top of the reflex plate with a separate piece of paper. This stops it from pulling away in the concave portion.

(9) Try giving the wing panel tissue a coat of the watered down glue just like the rest of the aircraft. It strengthens the tissue and acts like a plasticizer — i.e., it prevents brittleness with age.

(10) Finally, give the whole model a coat or two of dope. Little dope is required with this method and the affinity that the aliphatic type glue has for dope (and sanding sealer, too) is amazing.

Incidentally, this reminds me of another tip — nothing to do with covering. When gluing up airframes I use a tack of balsa cement to hold the bits together and then, when I am satisfied they are true, go over all the joints again with aliphatic glue.

#### Final Assembly:

(1) Fit the ailerons by gluing the hinges in place. Ensure that the ailerons are in the same plane as the wing and the gap is as small as possible.

(2) Glue the tip plates in place.

(3) Install the radio systems and

pushrods, threading the antenna through the tube in the wing. It may be a good idea to give the antenna a smear of Vaseline (grease) to help it slide easily through the tube.

(4) Bolt in the engine and install the fuel tank.

#### Trimming and Rigging Data:

The engine is set at 0° sidethrust and 6° to 7° downthrust.

(2) The ailerons are set at the same angle as the reflex plates. Then crank up the aileron on the side opposite the engine a degree or so and the other one down the same amount. This can be done by pushrod adjustment, or servo trim is available.

Full aileron travel at the outer corner is 9/16" each side of neutral on my Peltas. You may like to start with less aileron throw, as this amount of movement produces a very responsive model.

(3) Clockwise turning engines (viewed from the rear) are mounted on the left with the antenna extending from the right wing tip. Counter-clockwise rotation requires the reverse positions of engine and antenna.

(4) Center of Gravity limits are shown on the plan. Under no circumstances should the C.G. be further back than shown. It is preferable to go for the more forward position. The C.G. can be adjusted by shifting the location of the battery pack. The degree of change will be greatly dependent upon the size of the battery pack.

#### Flying:

Generally I am a little wary about test gliding small single channel models. As often as not it won't tell you much. Nevertheless, I recommend test gliding Pelta over tall grass with the radio switched on. She's a real floater when-trimmed out and it would be unwise to fly on power before you are satisfied with the glide. I find that it is better to err on the under-elevated side than the over-elevated side at this stage, and I crank the ailerons up a degree or so at a time if necessary until I am happy with the glide. It is advisable to begin with the C.G. in the forward position. The trim we are after for top performance is a combination of the most rearward C.G. with the least possible aileron reflex, while the safest 'learning trim' is the forward C.G. with ample reflex angle.

Remember that Pelta is a sensitive, fast, and highly aerobatic model that is designed to be on the verge of neutral stability. This means that it goes where you put it, and it can take an age and an enormous amount of air space to recover automatically from 'pilot error.'

Flying Pelta is terrific fun, and once you have learned its characteristics you will be able to 'fly the book.'

#### MATERIALS LIST

Balsa	
1/16" x 3" x 36"	(4)
3/32" x 3" x 36"	(1)
1/8" x 3" x 36"	(1)
3/32" x 3/16" x 24"	(2)
1/8" x 1/8" x 24"	(6)

1/4" balsa (1" x 8" and 4" x 2")  
3/8" balsa (4" x 2 1/4" - 2 req'd.)  
1/2" balsa (3" x 2 1/4" - 2 req'd.)  
Some scrap 3/16"

**Ply**

1/32" ply (8" x 12" grain lengthwise)  
1/16" ply (1" x 6" - 2 req'd. grain lengthwise)  
1/8" ply (2" x 7 1/4" grain lengthwise)  
1/8" diameter hardwood dowel (24") □

**From  
RCModeler  
Mar. 1980**