

# Meister Scale Zero

Gregg & John Veasey UK 2010

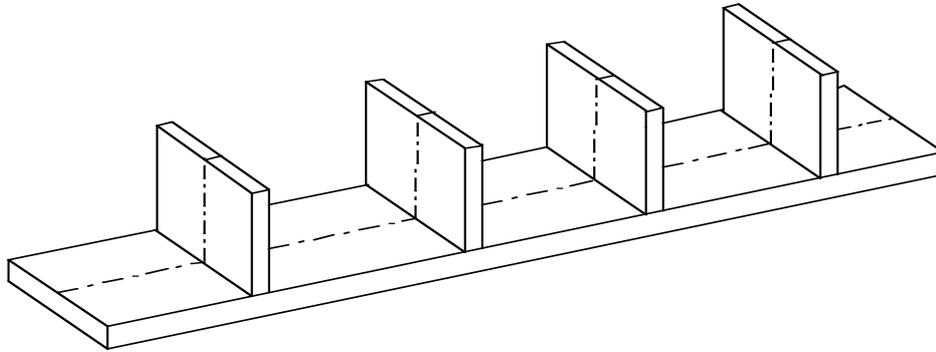
Having owned a Meister P51 many years ago and still owning both a Meister P47 and Corsair my dad and I decided to build a Meister Zero. During a visit to the UK in 2008 Dino visited our workshop to see the progress of the Zero, then following that visit made us UK Meister field reps. The model was completed in early 2009 and has since won the WW2 class at the UK BMFA nationals two years running.



**Before beginning construction of this model take the time to read the whole section you are working on and compare them to that specific area of the plans. Review them several times and also refer to the supplied photo's. If you have any questions please call Meister Scale.**

# Fuselage

- To build the fuselage you will need a jig consisting of a horizontal board 12" wide x 8' long with vertical pieces along it (as many as you like). Each piece **MUST** be the same height (1" x 8" x 8") and parallel to each other. You will also need to indicate the centre line on the base board and all the vertical boards as shown in the illustration.



- Next locate bulkheads B1 to B10 and position each on the crutch plan (sheet No 1) with the notches in the correct position. This is necessary to make sure the crutch is the correct width at each point. Paper shrinks and expands so it may be necessary to adjust the crutch build accordingly. Construct your crutch over the plan as shown, remembering to make any adjustments in width. Mark a centre line on each side of the crutch on each cross brace. These marks will help to align it on the jig.



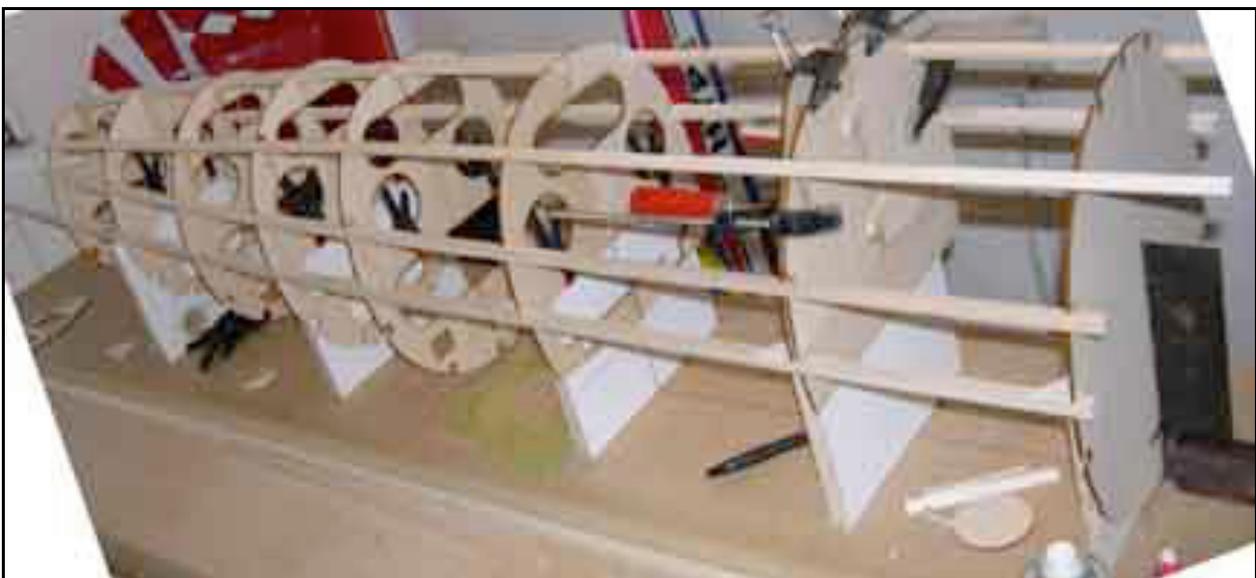
- Using white glue or epoxy stick B1 and B1A together and lay flat to dry. Once dry B1, B4, B6 and B8 can be installed on the crutch (Note, B4, B4A, B6 and B6A can be assembled as a unit before installing onto the crutch). Be sure to get each bulkhead 90°. Leave alone to dry checking that it remains straight and level.
- Once dry you can locate the rest of the bulkheads (except B10) making sure they are all 90° to the crutch.



- Locate HF-1 (Stab/tailplane seat) and glue to crutch. With the use of the centre line make sure you stick it accurately.



- To lock all the structure together you next need to add the stringers. You may need to splice together to get the required lengths. Install the stringers between B1 and B8. It is very important that the fuselage does not become warped when installing these. Ease the cutouts in the bulkheads if necessary so that they slide in and out freely instead of having to force them. Once the main stringers are in add the top stringers between B1 and B2/B2A then between B3 and B8.



- Finally install B10 again using a 90° square to get it accurate.

# Sheeting the fuselage

There are 2 schools of thought with sheeting both of which are explained below. The first way is quicker but harder to get a good final shape/finish.

## 1 – full width sheeting – the plans contain templates for the sheets

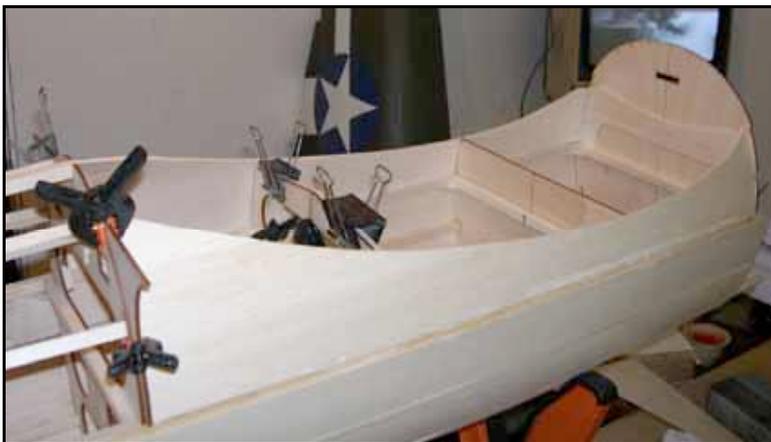
Locate centre line of the crutch on each side and install pins along it around 12” from each other. Starting with FS1A/FS1B on each side against pins. Working towards top alternately install FS2A/FS2B and FS2. Also add FS1B doublers on each side.

## 2 – strip sheeting

Cut sheets into strips that are around ½”-1” wide and gradually build up the sheeting. This is a slower process but can give a better shape once finished and sanded.



- Once you have sheeted the top of the fuselage you can remove it from the jig. You then need to install B1A to the backside of the firewall. This piece is to help form and glue the wing saddle doublers, FS4A (sheet 3).



- Now that you have a solid structure you can take a dremmel to the formers and make some weight savings. You can also add the additional stringers to the underside of the fuselage between B9A and B10.



- Remember that before you sheet the whole fuselage you need to think about how the back end is going to be controlled i.e push rods, air lines, closed loop wires etc. **It is beneficial to leave access through the bottom of the fuselage until the last minute.**

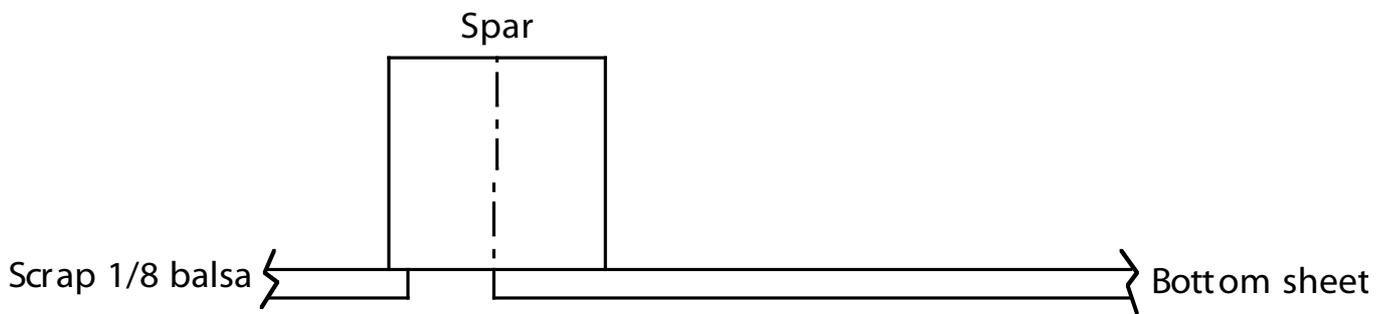
**Before you can complete the fuselage you will need the wing, completed and glassed, to enable you to do the wing seat and then the wing fairings/fillets.**

## Wings

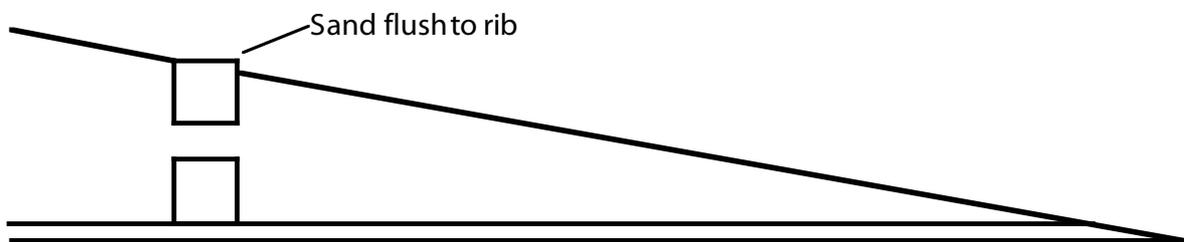
The wing design has a flat bottom so no jigs are necessary. However you will need a suitably sized **flat** surface to build on. The ideal would be a 50" x 36" board or even a piece of glass. You also need to decide which wing to build as the plans show three different versions all of which fit the same size fuselage.

Start with the left wing

- Firstly check that the spar notches in all the ribs are the correct width and depth (3/4 x 3/8).
- Assemble wing sheeting and mark it top and bottom as the bottom sheeting is shorter than the top sheeting.
- locate your aileron on sheeting, measure and cut sheeting. Use masking tape to hold in position making sure the tape is on the bottom of the sheet.
- Lay out plan on your board and lay bottom sheeting on it with front edge on mid line of spar. Then glue bottom spar on the sheeting using a straight edge to keep the spar perfectly straight. As the spar will be overlapping the sheet use some scrap 1/8 balsa to keep the spar flat on the front edge.



- Next install W2 to W7 making sure each is 90° to the sheeting.
- Locate 3/8 bottom spar between W1, W2 and flush on opposite side of W7, again making sure its perfectly straight.
- You can next install the rest of the ribs. The spar will be proud on the top and will need sanding to follow the shape of the ribs.



- Install gear sub ribs W4A and W6A making sure the rear bottom edge is flat to bottom sheeting behind the spar.
- Add shear webbing on backside of the top and bottom spar.
- Install spar up to centre line and trim out rib pockets as necessary. A tip here is to put 2 layers of scotch tape on the bottom of the spar before creating the pocket.
- Install sub spars between each set of ribs on top of the spar.

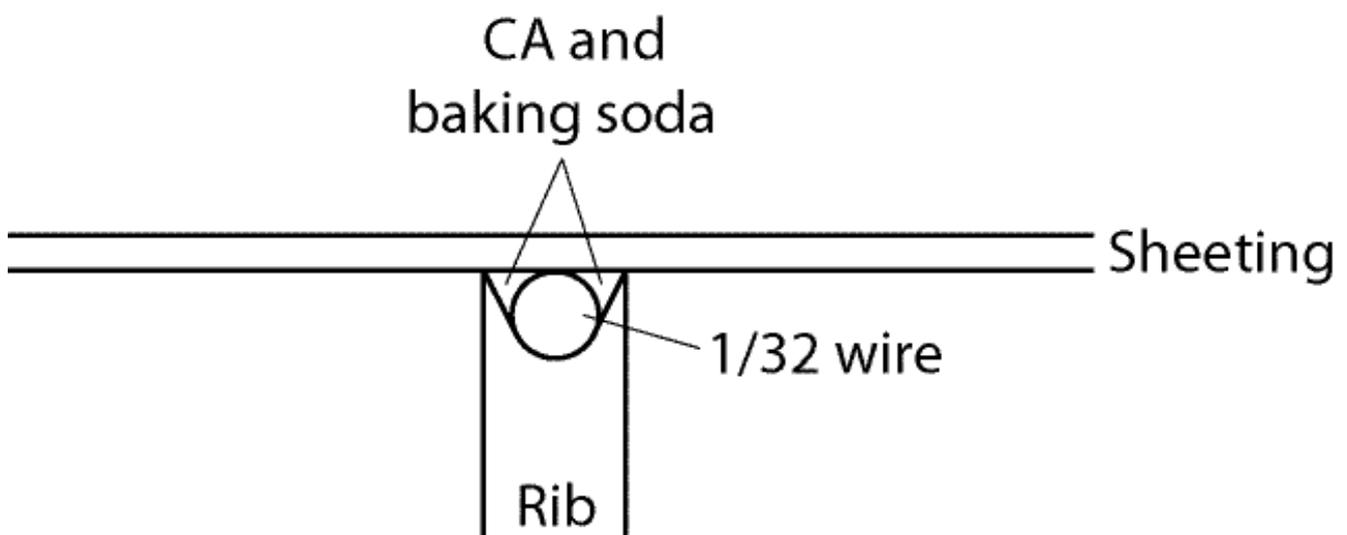
**Do one rib pocket at a time and remove spar checking that no glue is on the spar before putting back for the next pocket. If you try and do more than one pocket at a time you are in danger of getting the spar stuck in for good!**

- Next add front shear webbing noting that between R5 and R6 its 1/8 ply. You will also need to add tubes to take servo's wires before going much further.
- Before sheeting bottom front add the wing retaining tab. Then continue and complete the top rear wing sheeting using the templates from sheet 1. Be sure to cover all sticking areas with white glue and weight down sufficiently until dry. It is a good idea **NOT** to sheet the front of the wings until the retract plates are fitted. There is a guide indicated on the ribs to help but it will ultimately be determined by what retracts you are using. Care is needed to ensure that both legs are at the same angle and that the plates are very secure.

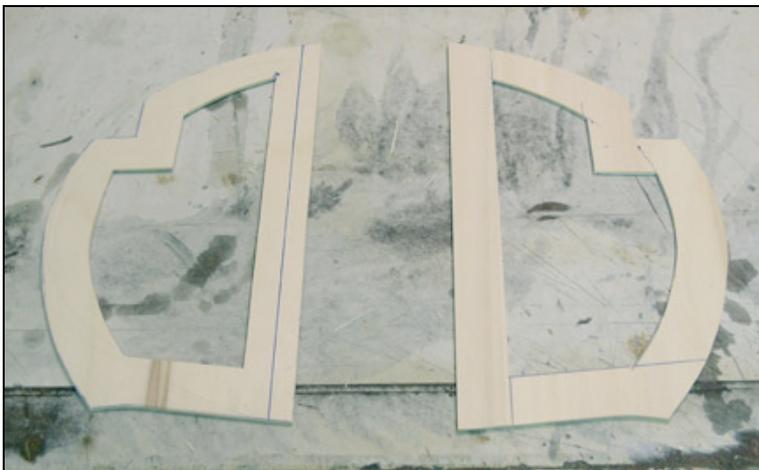


Also before sheeting you could use a tried and tested trick which will enable you to remove a lot of wood from the wings without changing the shape or affecting the strength. The trick is:

- cut a 'V' shape into the top of each rib from the spar to the leading edge.
- bend 1/32 wire to shape and use CA and baking soda to stick the wire into the groove
- plank over the wire. This will enable you to sand/grind the wood away in the wheel well down to the wire. Before you sand/grind though run a fillet of CA and baking soda on each side of the wire.



- Finish planking the bottom of the wing. If you leave the top un-sheeted in this area at the moment it will allow you to view and adjust your gear door attachment points.
- Finish planking once your gear doors are set.
- At this stage you need to add a few degrees of washout to the wing to reduce the risk of tip stalling at low speed. Before adding the top sheeting, lay the wing panel flat on the building board and put a wedge under the rear spar at W13. Once the sheeting is complete the washout will be locked in. The exact amount of washout is not critical but be sure both wing panels have the same amount. About ½” is fine.
- Install tip either from one piece of balsa that you shape, or by cutting a piece of thin ply to the correct shape which forms the centre and building up each side with balsa.
- Install the leading edges and sand them to shape.



# Under belly

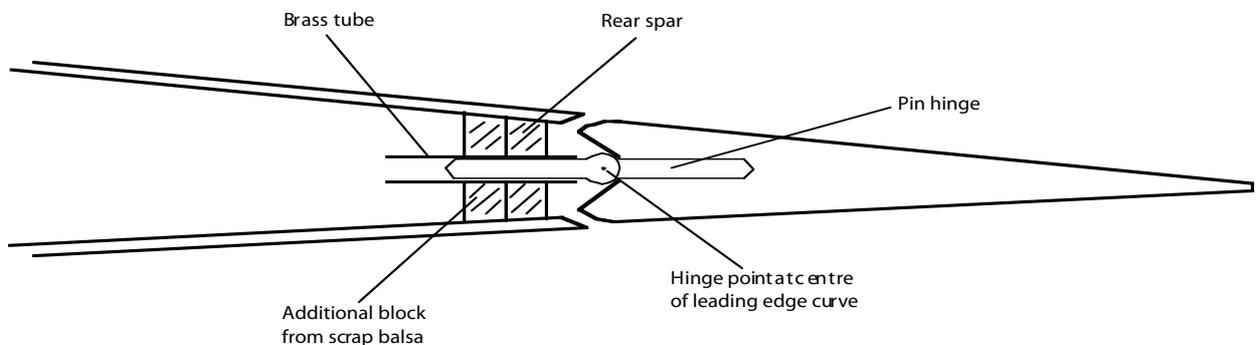
The belly is made from scraps of balsa and can be attached in two ways. You can either make it as one piece that's removable and held on with screws/bolts. Or you could make it in 2 halves and permanently fix it to each wing half.

## Hinging of rudder, elevators and ailerons

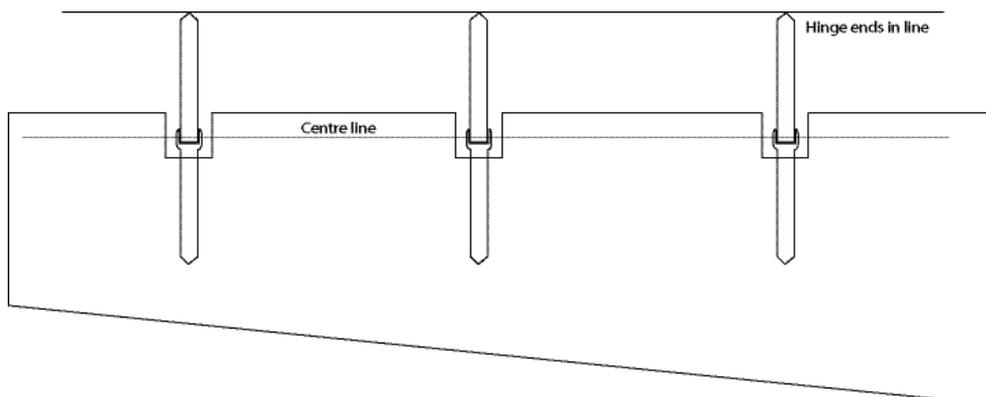
Depending on how scale you want the hinging to be will determine how you install the hinges and what type to use. You can either do the traditional way which is either top or centre line hinging using flat hinges as shown below:



Or you can go for the more scale route and use pin hinges. Using pin hinges allows you to have the overlap covering the hinge line but it is quite a job to get the hinge line correct as the hinge needs to be set into the trailing edge of the surface at the correct point to allow rotation.



As the pin hinges project from the trailing edge they need to be supported with lengths of 3/16 inside diameter brass tube about 1 1/4" long. Fix the hinge into the surface first before fixing the brass tube. Ensure that the centre points are in line by lining up the ends of the hinges.



Place the tubes onto the hinges but do not stick them yet and then slide them into pre drilled holes in the trailing edge. The holes can be a little oversize to enable you to line up the elevator with the tail plane/stab. When satisfied apply epoxy to the outside of the tubes, ensure everything lines up and leave to set. All of this is best done before finishing bottom sheeting so that you can ensure the tubes are secure. Once set the surface can be removed until finished and covered. **Be sure you don't get any epoxy on the hinge when sticking!**

**REPEAT THIS PROCESS WHEN FITTING THE AILERONS AND RUDDER**

## Seating the wing

You need completed wing halves to the glassing stage before you can seat the wings to the fuselage.

- Assemble the wings and support them so that you can put the fuselage over the front tab on the wing. Use 50-80 grit sandpaper and begin sanding (alternately) the saddle as shown below.



- Keep sanding each side until the top of the wing is seated on B4B. You will be left with a 1/32" gap between the saddle and wing fillet which will be filled with the wing fillet.
- Next remove the wings and install the wing bolt retaining blocks complete with their angled blocks underneath that house the blind nuts.



- You can put the wings back on and drill through the wing and blocks to locate the wing making sure it is square to the fuselage.

## Wing Fillets

- Cut the wing seats to shape from thin ply and stick them to the fuselage clamping them between the wing and fuselage. The wing should first be covered in plastic film to prevent the fillets sticking to it. You also add the rear triangular parts as this stage. Once set add the balsa pieces that will get sanded and faired into the fuselage.



- The fairings are made from 1/32 ply towards the back and scraps of balsa stuck in then sanded to shape towards the front. The joint would then be filled and blended into the fuselage ready for glassing.



## Fin and Rudder

- Using the FL pieces, the fin is built in exactly the same way as the stab/tail plane.
- The only difference is that the sheeting at the bottom of the fin needs to finish flush to the top of F1 and overhang F5. The lower edge will eventually be trimmed to fit the top of the stab/tail plane. Also need to install the sheeting doubler to the inside of A, B, C sheeting adjacent to F5.



**All surfaces on the full size had a trailing edge thickness of  $1/16^{\text{th}}$  meaning that careful sanding is required to duplicate this.**

## Rudder

- Using the template make the R3 parts. The material used should be as hard as you have (C grain). Do one side of the rudder at a time.
- Next install fin post and then ad ribs made from scrap 1/8<sup>th</sup> balsa.
- Install pine block for rudder control through R3. No cut out is provided. Its up to you to make a hole for your block. Its also a good idea to cut slot for your hinges at this stage too (assuming the use of pin hinges).
- Sand trailing edge sharp in readiness for sheeting. The sheeting needs cut outs to give the scale look and will need to be fabric covered. Add sheeting and tip FT1 but do not sand till you have it mounted/hinged to the fin.

Controlling the rudder can be either by use of closed loop or pushrod both of which can be external or internal. The route below shows the use of an internal pull-pull system. The L bent metal rod pivots in the ply plate and will be hidden inside the tail cone.



## Horizontal stab/tail plane

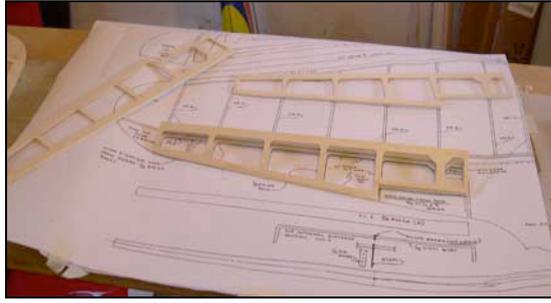
- Draw a 36" line on the workbench and centre both HS1's on it. Glue HS2 onto the HS1's and pin the assembly to your work surface.
- Glue the two HR1's together and put rib location marks on HS1 and HS2.
- Pin HR1 onto HS2. Install 90° cross brace (made from 1/8<sup>th</sup> balsa scrap) on each side and glue base to HS2. Repeat to install both the HR2's. Install HR8's using 90° braces.
- Next, using hard straight balsa, add leading edges between HR2 and HR8 plus small one between HR2's across HR1's. once set install all ribs making sure that they are all the correct length. If you use any that are too long they will cause the leading edge to bow. Constant use of a straight edge will prevent this.
- It is advisable to drill for the hinges now. You may also want to add extra reinforcing pieces where the hinges will be.
- Sand the leading edges and HS1's so that they follow the line of the ribs. You are then ready for sheeting.
- Make up A, B and C 1/8<sup>th</sup> balsa panels making them slightly oversize, and trial fit to the tail plane/stab.
- To prevent warping when gluing, both top and bottom should be applied at the same time (per side). To do this pin top and bottom panels to HS1 making sure they overhang the leading edge slightly. Then remove, apply white glue along all ribs (top and bottom) and thick CA along HS1 (top and bottom). Then apply sheeting, pulling both panels onto frame towards leading edge. Using CA stick the panels to the leading edge then clamp/weight down the rest till set.



- Once all sheeting is complete, sand the panels flush around all edges, then install softer balsa leading edge and shape.
- Then add the horizontal tips but do not sand/shape them till you have your elevators hinged and shaped.
- Finally, reinforce the centre section of the stab/tail plane with 1" wide reinforcing tape/glass

# Elevators

- These are constructed exactly the same as the rudder.



Controlling the elevators will be a personal preference. You can use pushrods to each half or have a single pushrod through the middle of the fuselage. The pic below shows the latter. This method uses a 1/8" piano wire elevator joiner with a brass horn silver soldered or brazed in the centre. **DO NOT USE SOFT SOLDER.** We always use two horns about 1/4" apart with a heavy duty ball link between them. The mechanism will not be accessible once the model is complete so extra care is required to make sure you only need to do it once!



## Fixing tail plane/stab

- Once you have the fuselage top sheeted and all the tail plane/stab seats set you can fix the tail plane/stab in place. Make sure you get glue on all the sticking surfaces and weight it down to dry. Also make sure that it is perfectly horizontal and square to the fuselage. This is best done with the wing fitted. You can then shape the bottom of the fin sheeting so that it sits perfectly on the tail plane/stab with the fin post vertical. The use of a square is essential here. The shape of the fin makes it difficult so the use of a marked piece of wood pinned to the top of the fin allows you to see if its vertical or not. Small shaped fillets of balsa were then put in place to aid with the fin/tail fillets which was done using strips of balsa



- After sanding the fillets to shape they need raising to simulate the full size. This is done either with filler or outlining with ply and the inner filled with balsa.

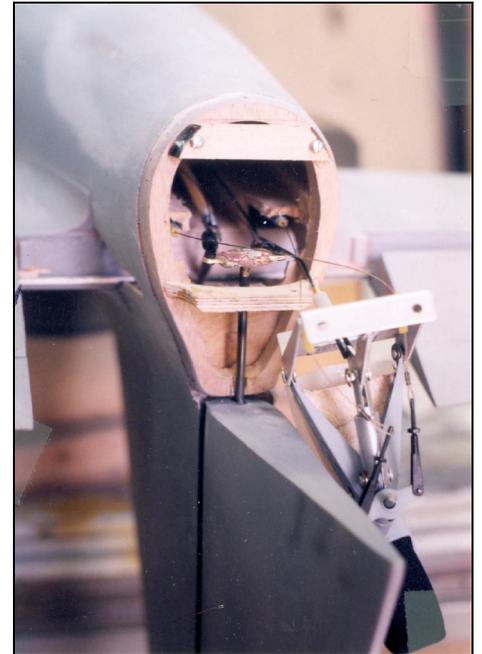
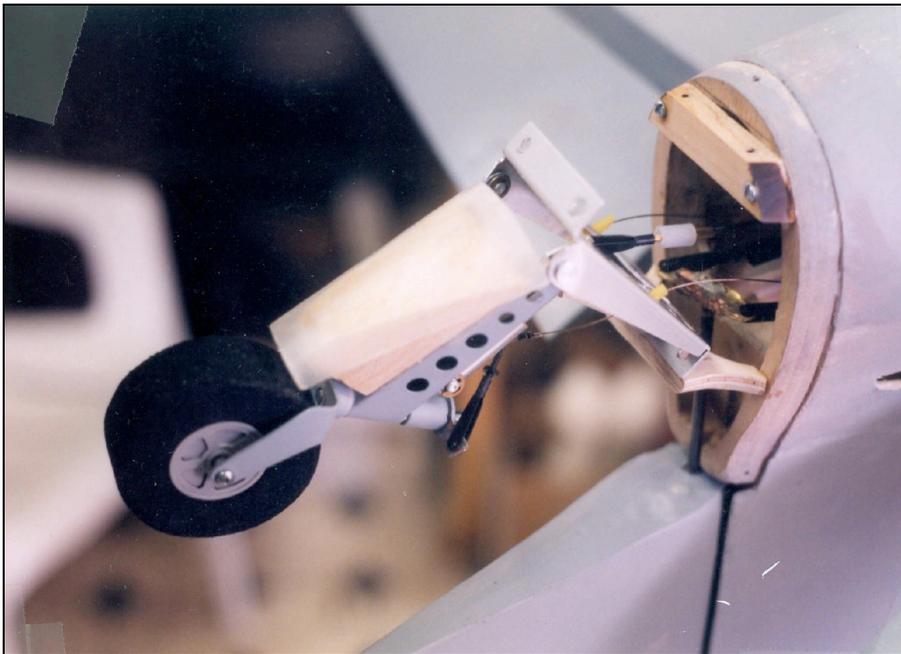


## **Tail wheel and tail cone**

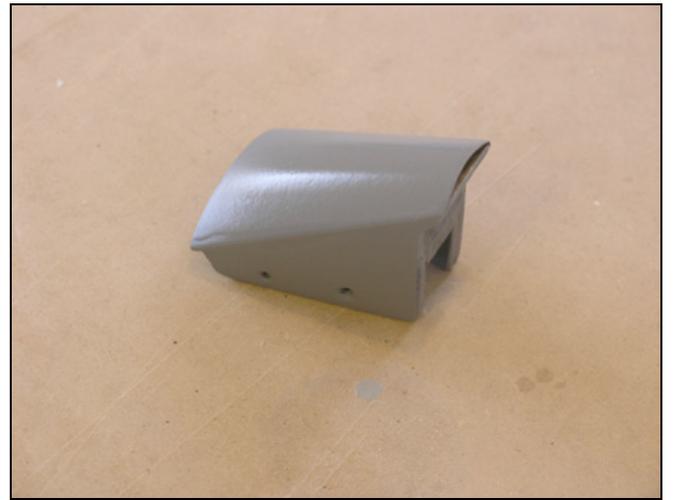
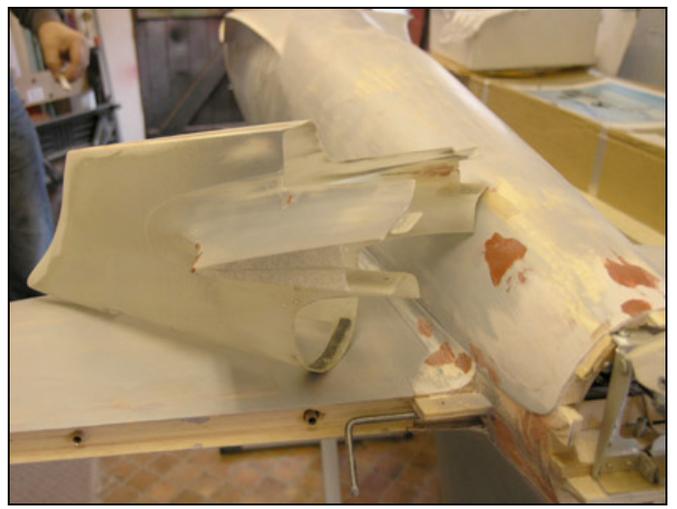
- The tail wheel also mounts to the back and needs controlling so separate cables are required for this. That means its quite busy in this area but is very achievable and leaves everything hidden once the tail cone goes on. For this reason it's a good idea to make the tail cone removable.



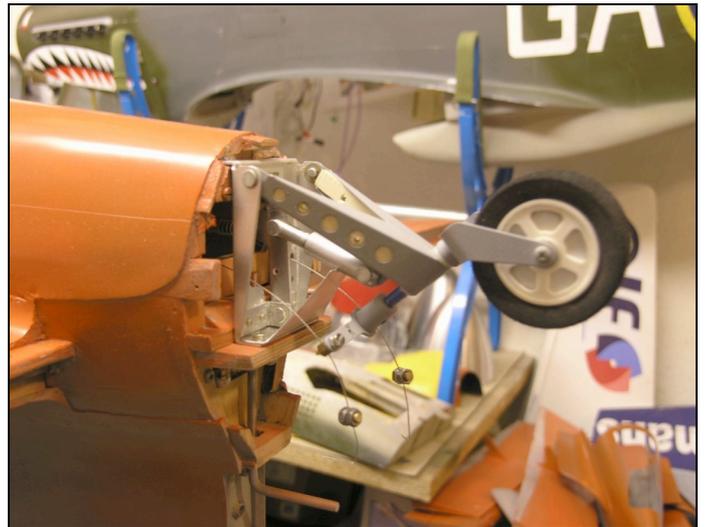
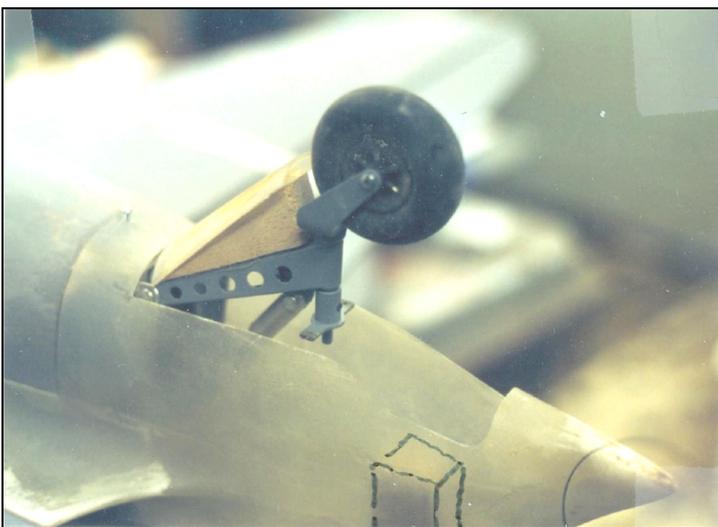
- Another example below. This uses an air cylinder to retract the tail wheel. Note that at this stage all the balsa was removed and F10 cut out to gain access. The tail wheel assembly is mounted using 2 pieces of hardwood. The pic also shows the lip where the tail cone goes so that it finishes flush with the fuselage.



- To make the tail cone removable you need to create a lip on the fuselage and add tabs to the cone. The cone also needs the bottom cutting out for the tail wheel and unit to pass through. Take care when cutting though as the cut out part will form part of the cover. The rest of the cover is built up with wood and screwed to the tail wheel unit.



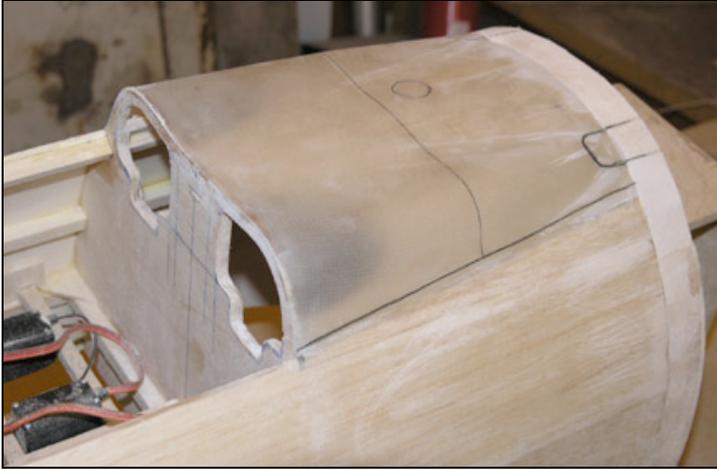
To be scale the tail wheel when retracted does not go right inside the tail cone. To achieve this you need some form of stopper. This can be done with a wood block or with a metal bracket as shown in the pics below.



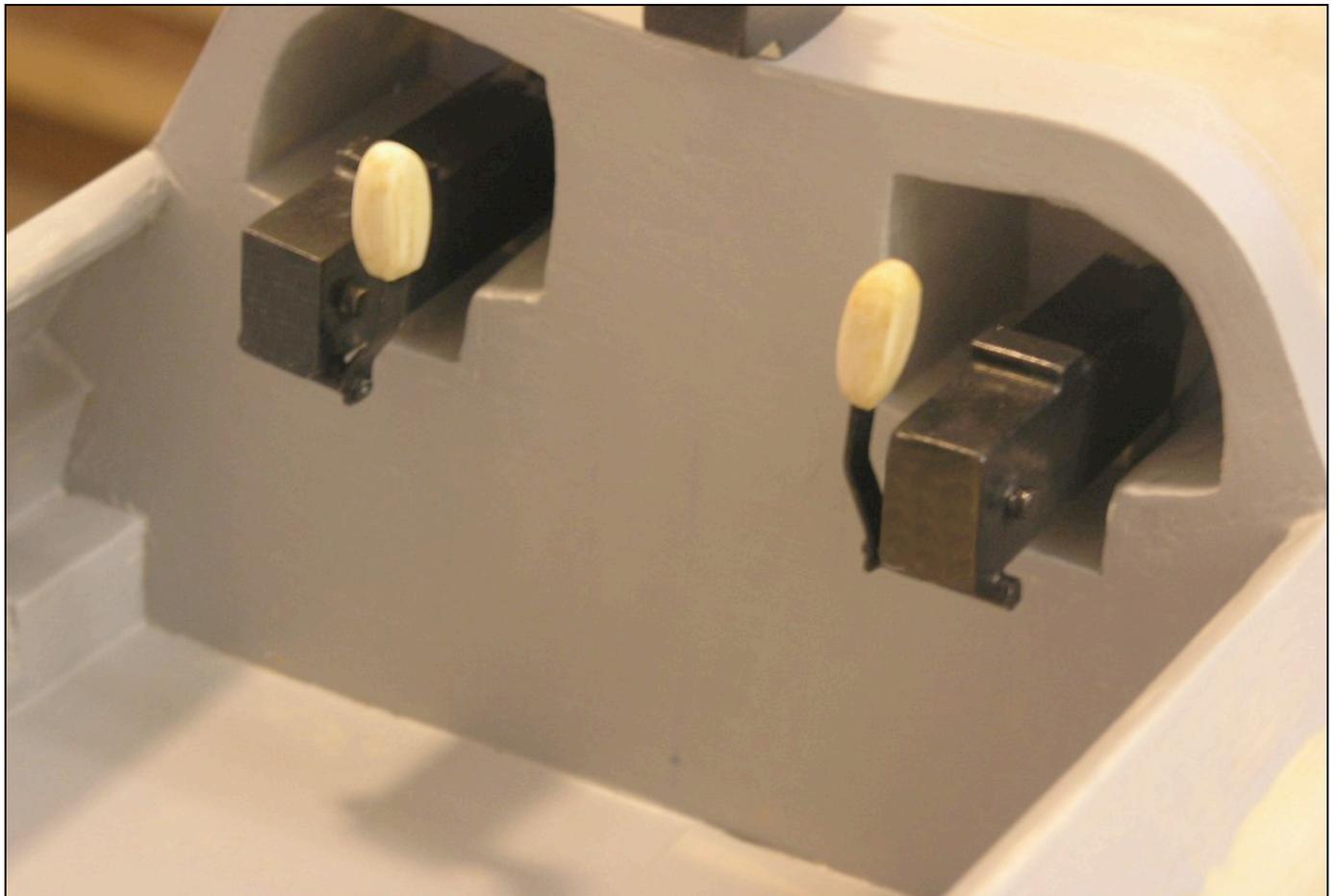
The tail wheel on the right above is a lightweight plastic wheel with a foam tyre which was put in a drill chuck and sanded down to a scale flat section.

## Nose fairing

- The top nose cover is a moulded part that sits on the front once the model is glassed. Once stuck on it needs blending into the fuselage. It also needs the machine gun recesses cut out which is easier to do before fitting.



- The cut outs in the dash board are for the machine guns. These again would be easier to do before the model is constructed but careful use of a dremmel does the job.



## Mounting the cowl

The simple way to mount the cowl is to use metal 'L' brackets fixed to the firewall. The problem with this method is that the weight of the cowl can cause the fixing screw holes to wear and the cowl becomes loose. If you have the fixing points further forward the load on these is reduced. Its also nice to have the mount hidden inside the cowl, accessed through the front.

The below method is how this can be achieved:

This uses an 1/8th ply plate on the front of the engine box. The exact shape would depend on what engine you are using as you need to allow for the exhaust/muffler etc.



The cowl mount shown in the 3<sup>rd</sup> pic above is trimmed until it slides into the cowl approx half way down. The inside is then cut out similar to shown, again ensuring it clears the engine all round. Captive nuts are then fixed to the ply plate and 6mm allen bolts are used to bolt the cowl mount ring to the fixing plate. The cowl can then be lined up and bonded to the fixing ring. This method obviously requires a bit more time and effort but the end result is very secure, has no visible fixings and won't come loose. Ours hasn't!

## Canopy installation

The canopy is supplied in 2 pieces and needs trimming to fit the fuselage exactly. Once trimmed install some pins next to the front windshield, along the bottom of the sides, and at the rear to get the exact location when gluing the canopy down. NOTE: DO NOT USE CYANO!

However you may want to make a sliding canopy as shown. This will mean cutting the canopy into 3 pieces and adding rails to the fuselage. Rails for this purpose are available commercially but the rails on this model were hand made using 7/32" square brass tube with a slit milled along it to accept a 2mm bolt. The edge of the canopy is reinforced with a strip of 1/4" wide brass which is drilled and tapped to accept the bolt. The canopy is removable by having holes at the rear of the square rails large enough for the head of the bolt to pass through.



## Spinner assembly

NOTE: it is important that the back plate skirt matches evenly with the spinner plate.

- Using a 10 or 12 x 1-1/4" wood screw secure the back plate to your work bench (skirt down). Do not bend the back plate when mounting.
- Cut your blade exits in the spinner.
- There should be four holes for 4 - 40 x 1/4" bolts spaced between the cut-outs to secure the spinner to the back plate. Place these holes 3/18" up from the spinner skirt bottom. Tap 4 - 40 threads through the spinner and back plate.
- An alternative method is to use the clinch nuts and screws that come with the spinner. This method is highly recommended.

## Engine box

The engine is mounted on a 1/4" plywood box that fits into the cut out in the firewall B1. This can then be slid in or out depending on your choice of engine, and needs to be long enough for it to protrude into the fuselage by about 1". Once adjusted to the correct length it can be glued in place and the joint reinforced on both sides of the firewall with hard triangular stock. You do not want this to pull out! This unit is heavily loaded and therefore needs to be very strong with all joints preferably screwed and glued. For the same reason, you need to ensure that the firewall is very securely bonded into the fuselage.

If you choose to add side thrust (We never do on warbirds), the side thrust should be built into the engine box, not the firewall.

All the Meister warbirds will fly very well with a Zenoah G62, but will benefit from a little more power.

## Dummy exhausts

The dummy exhaust stubbs are fixed to 1/8<sup>th</sup> plywood tabs inserted into the balsa which is bonded to the front of the firewall



## Radio Installation

There is plenty of room in the fuselage, and enough room for a full cockpit, kits of which are available from Meister.

The Zero has a long tail and short nose meaning that C of G is an issue. Because of this you need to install all of the radio gear as far forward as possible or be prepared to put lots of extra lead in the front.

## Control throws/measurements

- Ailerons: 1" up and 3/4" down
- Elevators: 3/4" up and 3/4" down
- Rudder: 2" both ways
- Flaps: 50/60 degrees
- Elevator mix: 3-4mm down elevator with full flap
- C of G: 8" from leading edge at wing root

**Note: When deploying flaps the model will climb dramatically. Mixing 3-4mm down elevator with flaps will cure this.**

**There is a full build thread of our Zero on both [RCScaleBuilder](#) and [veaseyjet.com](#)**

**Happy building**

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# Full size reference pics

