

Mini Metro Mk2

39in Span Fun Sports Aerobatic Slope Soarer

Designed by: Stan Yeo

Produced by: Phoenix Model Products

Introduction



The Mini Metro was originally designed in the early eighties as a fun model and a precursor to the very popular Vagabond and Vagrant designs. The simple, easy build design not only makes it a pleasure to build but an ideal first building project. The Mini Metro is a lot of fun to fly and will fly in most light to moderate wind speeds. Due to its size it is very manoeuvrable and does spectacular flick rolls. The model has been 'resurrected' in response to a number of requests.

Construction features a slab sided balsa fuselage which can house standard size RC equipment. The Mini Metro was our first model to use, our now standard, quick and easy to build, fully sheeted built-up wing construction. All parts are accurately cut using a laser / router and the materials specially selected for the job it has to do.

Radio Equipment Required

The recommended radio equipment required to fit out the Mini Metro Mk2 is two standard size servos, a Square AA receiver battery and a 4 channel receiver.

Tools / Materials Required

The tools required to build the Mini Metro Mk2 are a modelling knife with spare blades, a miniature David Plane, 180 grade Wet & Dry sanding block and soldering iron. The glues used to build the model are white PVA wood glue, thin Superglue (please observe safety precautions) and a small quantity of two part epoxy. We recommend using a polyester film for covering such as the lighter more economically priced Easycoat in preference to the heavier more expensive Oracover.

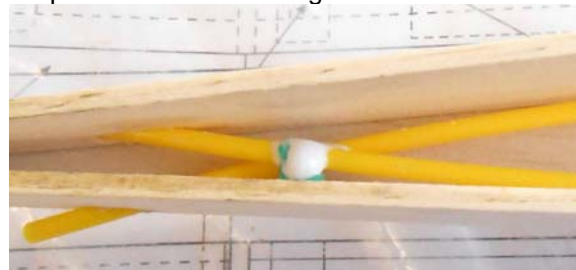
Please Note for ALL wood joints use PVA wood glue unless otherwise stated.

Building the Fuselage

1. Mark out the position of formers F2 & F3 on the inside of the fuselage sides ensuring there is a left and right side.
2. Cut slot for Elevator cable exit as indicated on plan (bottom of fuselage).
3. Using PVA (wood glue), glue spruce nose and wingseat strips to fuselage sides. Note wingseat strip extends back beyond F2. *Tip. When in use park PVA bottle upside down in small bake bean can.*



4. Glue strip longeron super structure on the fuselage sides.
5. Lightly sand edges of fuselage side to prepare gluing surface to receive top and bottom sheet.
6. Join fuselage sides together over the plan ensuring that both are straight and square.
7. Mark leading edge position of Tailplane. Cut rear fuselage bottom to size and glue in position.
8. On tailplane trailing edge lightly mark centre of tailplane.
9. Draw a 'T' line on back of plan to represent the fuselage datum line and the Tailplane hinge line. Ensure the TP hinge line is at right angles to the fuselage datum. Place plan on building board covering Tailplane gluing area with cling film.
10. Align Tailplane hinge and TP centre line with datum lines drawn on plan. Pin Tailplane in position on the building board.



11. Glue Tailplane in place aligning centre of fuselage with fuselage datum line and trailing edge of Tailplane. Place weight on top of rear fuselage to hold it position until glue is dry.
12. Glue Fin in position using set squares to aid vertical alignment. Reinforce base with scrap 3mm square strip.

13. Fit Elevator control rod. Anchor to the fuselage side every 100-120mm using spare 6mm x 10mm strip to make a bridge. Superglue in place. Before fixing control cable check control cable inner is not binding and moves freely.
14. Fit fuselage top sheet.
15. Fit Fuselage bottom front and 10mm top nose sheet.
16. Sand the front of 3mm ply former F1 flat and fit Noseblock.
17. Angle rear face of hatch to match front face of F2. Centrally position ply end face and Superglue in position.
18. Cut Hatch to length and slope end at front of hatch to match abutting face. Allow enough space between the front of the hatch for the two ply end faces plus enough to 'jam' a third ply plate (supplied) to hold the hatch in position whilst the 'front end' is sanded to shape. This gap is to allow for the thickness of the covering material and fitting / removal of the hatch.



19. PVA Glue ply faces in position and jam hatch in place using third piece of 0.8mm ply. (Superglue can be used but with extreme care!). Do not shape the front 0.8mm end faces.
20. Shape fuselage nose.



21. Using the Latch Pin hole in F2 drill a 1.5mm hole through into the hatch and dry assemble / fit the Hatch Latch.



22. Remove latch and glue 0.8mm ply Latch plate in position.
- 23. Cover Hatch.**
24. After covering epoxy the Hatch latch in position and fit front 0.8mm ply locating tab.
- 25. Build Wing.**
26. Assemble / mount On/Off switch.

27. Fit Rudder and elevator servos.



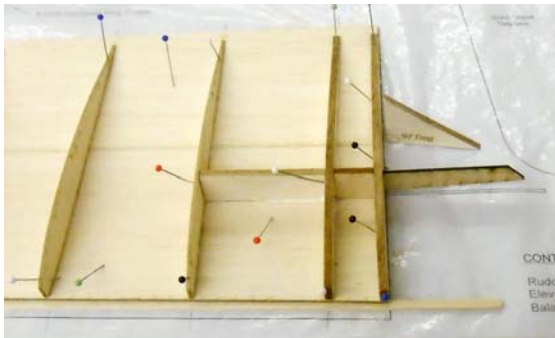
28. After covering hinge Elevator control surface using clear UV resistant plastic tape..
29. Fit Rudder and Elevator control horns and assemble control rods as per diagram.



30. Use electrical crimping tool or pliers / sidecutters to crimp plastic control rod to cable adapters and brass tube joiners. If using the latter, take care not to cut the control rods in two. Solder the Z bend joiners to the brass tube before joining with the plastic control rod.

Building the Wings

1. To protect the plan cover it in either thin clear polythene or cling film.
2. We strongly recommend that the wing is built using PVA wood glue. The reason being Superglue changes the texture of the wood and makes it less resilient to crash damage. Superglue can be used for non structural joints such as wing tips & band protectors.
3. Join front & back 1.5mm sheeting. Use metal straight edge to trim for a good joint. The sheeting has been Laser cut but may require further trimming due moisture changes in the wood. Sellotape them together along the joint. Hinge joint back and insert PVA glue. Place on flat surface and wipe away excess glue. Run Sellotape along top of joint. Weight down until glue set. Repeat for other three pieces. Alternatively run a thin bead of very thin Superglue along the join line. The downside of using Superglue is that it penetrates the wood along the joint and stiffens it.
4. Pin bottom 1.5mm sheeting to plan aligning sheeting trailing with wing plan trailing edge. Note the leading edge of sheeting extends beyond the front of the rib.
5. Elevate front of underside of bottom sheeting with scrap 1.5mm balsa to conform with contour at front of Wing rib (see plan)
6. Using guide lines on the plan, glue ribs in place taking note of how much the sheeting extends beyond the front of the rib.
7. Fit 3mm sheet vertical webbing between ribs W1-W3 using ply dihedral brace to assist alignment. Do NOT glue dihedral brace remove after positioning webs.



8. Chamfer trailing edge of top sheeting as shown in wing cross section.
9. Fit wing top sheeting taking care to ensure that it is making good contact with all the ribs.
10. Using a David Plane and a 180 grade Wet & Dry sanding block carefully trim and sand leading/trailing edge sheeting until level with ends of wing ribs. *Tip: when using David Plane set blade at slight angle so that the cut is thinner on one side of the plane. It helps control thickness of cut.*
11. When satisfied place Sellotape along sheeting edges top and bottom to prevent surplus PVA spilling over onto 1.5mm sheeting. *Tip: Let Sellotape overlap edge of sheet and then trim along the edge with a sharp scalpel.*
12. Fit leading edges. Use Masking Tape to hold in place whilst the glue sets.
13. Remove masking tape and shape Leading Edge.



14. Carefully align and glue wing tips in place and carve / sand to shape.
15. Build second wing panel.



16. Dry assemble wing panels with 50mm dihedral under each wing tip. When satisfied glue wing panels together using PVA glue.
17. Glue 0.8mm ply wing band protectors along trailing edge in position as indicated on plan.
18. Harden wing leading edge in wing band area with thin superglue to protect it from band damage.
19. Give a final sanding with fine Wet & Dry paper before covering. Do NOT use a sanding block as this will reduce the thickness of the wing sheeting in contact with wing ribs and weaken the wing.

Covering & Finishing

1. The originals were covered in Easycoat heat shrink polyester film and this has proved more than adequate. Should you wish to cover in a different material please take into account any potential weight penalty that it may incur and puncture / tear resistance / repairability.
2. Give the complete model a final sanding with 320 grade Wet & dry. DO NOT use a sanding block on wing sheeting. It removes material from the top of the rib and weakens the wing.
3. Before covering vacuum the model to remove embedded dust to avoid 'pimpling' the covering.
4. Please follow the instructions for the covering material being used. Normal procedure is to tack the material in the middle at one end. Tack the other end and proceed to gently stretch and tack along its length before sealing all along the edges and shrinking with a Heat Gun.
5. Fit Elevator control horn and Elevator 'snake'.
6. Hinge Elevator using clear UV resistant self adhesive tape and carry out final adjustment to elevator.
7. Balance the model. The model should balance without the need for nose or tail weight.
8. Balance the Wings (laterally). Bury any weight, if required in the Wing Tip.
9. Set the control movement as per the plan i.e. Elevator +/- 10mm. rudder +/- 30mm Balance Point 64mm +/- 3mm from Leading Edge. If using 2.4Ghz R/C equipment it is recommended that you re-bind / pare the receiver to update receiver settings. Please consult your equipment manual.

Flying

When satisfied with the model set-up and is ready to go, choose a suitable site and day to test fly i.e. wind not too strong or too light. If you are inexperienced on this type of model as a minimum get an experienced helper to launch the model. If set up correctly very little trimming should be required. The rubber bands holding the wing should be tight enough to stop the wing moving in flight but not tight enough to stop the wing moving on a not so perfect landing. The Mini Metro Mk2 is a lot of fun to fly, capable of almost any non-inverted manoeuvres that a non-powered model can perform including in the right conditions inside loops, barrel rolls and spins. Use your imagination! There are a number of articles on flying slope soarers on our website www.phoenixmp.com, they include basic aerobatics, a discussion on landing techniques and more detailed information on model preparation.

Happy landings,

Stan