Stage 2 Mk2

63in Span Sports Aerobatic Slope Soarer for 4-6 Channel RC Equipment.

Designed by: Stan Yeo

Produced by: Phoenix Model Products

Introduction

The Stage 2 was originally designed as a more sporty rudder elevator only model but it was also available as an Aileron trainer hence the rubber bands to hold the wing on. Rubber bands have the advantage that if the model lands awkwardly then the wing can slide on the fuselage and hopefully avoid being damaged. With the addition of twin aileron servos and with the aid of a computerised transmitter there is a very noticeable improvement in the aerobatic performance of the Mk2 over the Mk1 version of the Stage 2. Sustained inverted flight in lower lift conditions and outside loops etc. are all part of the Mk2's repertoire despite the predominately flat bottomed wing section. Once again we have replaced the foam veneer wing of the Mk1 with a lighter fully sheeted built up wing avoiding the use of epoxy / polyester resins which some modellers are allergic too. The kit is very comprehensive with virtually all the fiddly bits pre-cut. Also included are purpose designed wing servo mounts

Radio Equipment Required

The recommended radio equipment required for the Stage 2 Mk2 is two metal geared servos i.e. Hitec HS82MG or the Ripmax New Power XL16HM or XL17HMB plus two standard size servos, a Square AA receiver battery and a 4/6 channel receiver. For Flapperons operation a 6ch transmitter and 6ch receiver is required.

Tools / Materials Required

The tools required to build the Stage 2 are a modelling knife with spare blades, a One Metre Straight Edge, a miniature David Plane,180 grade Wet & Dry sanding block and soldering iron. The glue used to build the model are white PVA wood glue, thin Superglue (please observe safety precautions) and a very small quantity of two part epoxy. We recommend using a polyester heat shrink film for covering such as Oracover/Profilm or the thinner more economic version Easycoat.

Please Note for ALL wood joints use PVA wood glue unless otherwise stated. Also for maximum glue joint strength we recommend lightly sanding laser cut edges before gluing.

Building the Fuselage

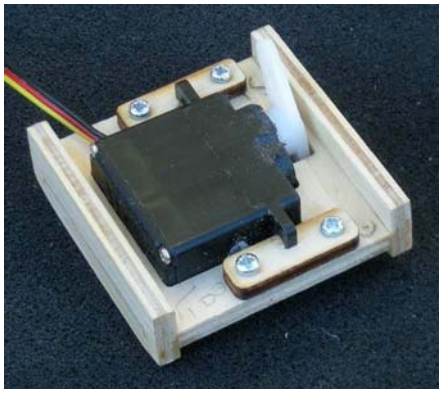
1. Lightly sand the fuselage sides, top and bottom with 180 grade wet and dry to remove the 'release' agent. Remove dust with a small brush or vacuum cleaner.
2. Mark out the position of formers F2 & F3 on the inside of the fuselage sides ensuring there is a left and right side.
3. Cut slot for Elevator cable exit as indicated on plan (bottom of fuselage.
4. Using PVA (wood glue), glue spruce nose and wingseat strips to fuselage sides. Note wingseat strip extends back beyond F2.

5. Glue strip longeron super structure on the fuselage sides.
6. Lightly sand edges of fuselage side to prepare gluing surface to receive top and bottom sheet.
7. Join fuselage sides together over the plan ensuring that both are straight and square.
8. 7. Lightly mark out centreline on tailplane ensuring it square to the hinge line.
9. Glue triangular strips to base of Fin and glue Fin to Tailplane ensuring it is perpendicular and ***square***. If when glue has set it is not quite perpendicular to the Tailplane then slice the triangular strip on the acute angle (leaning towards) side and insert a thin cardboard wedge to correct inaccuracy. Superglue wedge in place.
10. Glue Tailplane in place checking that it is both horizontal and the distances between hinge corners on tailplane to centre of F2 are equal.
11. Fit fuselage top sheet. When glue has set drill hole close to Fin at an acute angle for the Rudder control rod. Use a long drill constructed from a piece of 3mm (10swg) piano wire as per the wing dowel drilling tool shown on the plan.
12. Fit Rudder and Elevator control rods. These must be anchored to the fuselage side every 100-120mm using spare 6mm x 10mm strip to make a bridge. Superglue in place. Before fixing control cables check control cable inners are not binding and move freely.
13. Fit Fuselage bottom front and back plus 10mm top nose sheet.

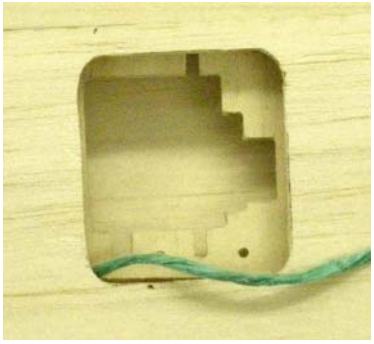
14. Carve out Noseblock to accept 90grms Nose weight. Approximately a further 60grms of nose weight may be required inside the nose area to achieve the correct Balance Point.
15. Sand the front 3mm ply former F1 flat and fit Noseblock.
16. Angle rear face of hatch to match front face of F2. Centrally position ply end face and Superglue in position.
17. 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 fitting/removal.
18. Align back of hatch with holes for 3mm hardwood dowels in F2 and drill dowel holes through F2 into hatch.
19. Dry fit 3mm dowels in hatch to prevent hatch from moving during nose shaping.
20. 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.
21. With the hatch firmly held in position sand and shape nose to achieve a smooth line.
22. Remove Hatch from Fuselage and fit 3mm Hardwood retaining dowels and Hatch latch. Grease Latch before Epoxying brass tube in place to prevent it sticking.
23. Fit and hold wing in position and drill hole for wing retaining dowel brass tube (use drill described on plan). Drill a pilot hole first using previously made 3mm piano wire drill.
24. Using the wing to align the wing retaining nut plate, assemble and fit said plate.
25. Bolt wing in position and fit front and rear wing fairings.
26. Fit Elevator servo. Mount On/Off switch. Fit Rudder servo.
27. Cut Mylar Hinges to size (12mm x 25mm). Trim corners to stop the digging in and roughen gluing surface with wet & Dry.
28. Hinge Rudder and Elevator control surfaces. Do NOT glue until the model is covered.
29.
30. wingseat extends back beyond F2.

Building the Wings

1. To protect the plan cover in either thin polythene or cling film.
2. Glue together Wing Servo Mount Assembly using PVA. Consult plan as they are handed i.e. there is a left and right hand! If you make a mistake the mount can be disassembled in water!
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.
4. Accurately align bottom sheet, the one with the servo cut-out, on plan. Note rear of sheet overhangs rear spar by 1.5mm.
5. Accurately mark position of mainspar on bottom sheet and using a straight edge glue and pin mainspar in place.
6. Elevate underside of sheeting at front and rear with scrap to conform with airfoil profile
7. Omitting W1 glue wing ribs in position.
8. Glue 6mm strip to front of Mainspar 1mm from the top. Ensure that it is a snug fit between the ribs.
9. Glue together Wing Servo Mount Assembly using PVA and before glue sets fit mount into servo bay between W3&4. Consult plan as they are handed i.e. there is a left and right hand! Push sides of servo mounts against W3&4 to make good gluing contact.



10. Using guide lines on plan glue ribs in place. For the servo bay ribs use servo mount for alignment.
11. Build second Wing.
12. Trim and align root end of each wing panel. Note the mainspars are strait and not swept in either direction. Glue panels together.
13. Glue 0.8mm ply floor panels in place and ply wing brace.
14. Fit Spruce rear spar reinforcing strip. W1 sub-ribs.
15. Thread string through servo bay and ribs to aid final servo installation
16. Trim and fit 1.5mm top sheeting taking care to ensure that it is making contact with both the wing ribs and the mainspar.



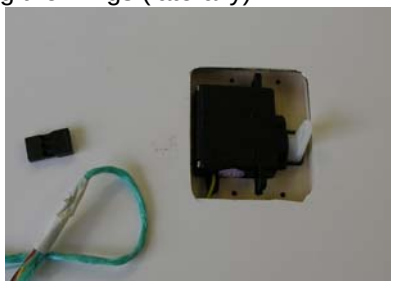
Tip: Use masking tape to support sheet whilst glue sets.
17. Using a David Plane / 180 grade Wet& Dry sanding block trim leading & trailing edge sheeting until level with the wing ribs. When satisfied place Sellotape along edge of sheeting top & bottom to minimise glue overspill. Tip: Do not try to align Sellotape with

edge of sheet but let it overlap and trim with a sharp scalpel.

18. Carefully plane/sand both rear spar and leading edge to shape. *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.
19. Glue 0.8mm ply end ribs to balsa tips. Again there is a Left & Right! Roughly shape and glue tip in place taking care to align tip end rib with wing end rib.
20. Sand wing tips to shape.
21. Fit centre section trailing edge.
22. Shape Ailerons and cut to length. At this stage do not make allowance for 0.8mm ply ends.
23. Tape ailerons in position using Wing Tip as a reference. Check for twist.
24. Using ailerons as a guide mark TE position on centre section trailing edge. Lightly draw guide line along TE.
25. Shape centre section TE to shape using Aileron as a reference. When complete add 0.8mm end plates and mark position of aileron control horn.
26. Cut slot for aileron control horn. Needs to snug fit. Roughen surface and superglue in position AFTER covering.
27. Give wing a final sand using 320 grade Wet & Dry. Using Superglue, harden LE in the wing band area to protect it from wing bands.
28. Draw a line on underside of Ailerons to indicate extent of shaping required for down going Aileron relief. Shape ailerons and cot to length allowing for 0.8mm ply end plates.
29. Cut slot in Aileron for fibreglass control horn. Do NOT glue in position until Aileron is covered.

Covering & Finishing

1. The originals were covered in heat shrink film (Profilm/Oracover). 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 thins the sheeting on top of the rib and seriously weakens the wing.
3. Before covering vacuum clean the model to remove embedded dust to avoid ‘pimpling’ when covering.
4. Please follow the instruction for the covering material being used. Normal procedure is to tack the material at one end. Tack the other end and then proceed to gently stretch and tack along its length before sealing all along the edges and shrinking with a Heat Gun.
5. Spray wing fairing to match your colour scheme (rattle can) (Hycote gloss white is a perfect match for white Profilm). Mask wing first!
6. Fit aileron servo output arms in centre position.
7. Superglue Aileron control horns in position and hinge Ailerons using UV resistant clear plastic tape and fit aileron servos.
8. Centre Aileron servos using transmitter sub-trim and adjust Aileron pushrods. When satisfied tape servo covers in place.
9. Fit controls, hinge rudder, carry out final adjustment to elevator neutral and balance the model including the wings (laterally).
10. Set the control movements as per the plan i.e. Elevator +/- 10mm. Rudder +/- 30mm.



Aileron Up 16mm Down 13mm. Full up Elevator, Flap Down 2mm. Full Down Elevator, Flap Up 4mm. Landing Flap1 Up 6mm Landing Flap2 Up12mm. Balance point 62mm +/- 5mm from Leading Edge. Exponential is recommended for both Aileron and Elevator controls. Typically 30%. Landing flap will require up elevator to compensate for nose down attitude when deployed.
11. If using 2.4Ghz R/C equipment it is often recommended that you re-bind / pair the receiver to update failsafe settings. Please consult your equipment manual.

Flying

When satisfied the model is set-up and ready to go choose a suitable site and day to test fly it 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. The wing bands should the tight enough to stop the wing moving in flight yet allow the wing to move if model lands awkwardly. If set up correctly very little trimming should be required. The Stage 2 is capable of almost any manoeuvre that a non–powered model can perform including in the right conditions sustained inverted flight, inside and out side loops with rolls in the middle. The only real limitation is your flying ability and 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

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