

Spitfire CS

1250mm Span Electric Sports Model 4/500w Motors & 4-6 Channel RC Equipment.

Designed by: Stan Yeo

Produced by: Phoenix Model Products

Introduction



The Spitfire is an iconic World War 2 fighter and almost a must for every modeller to build. Like other Character Scale (CS) models in our range a number of liberties have been taken in designing the Spitfire whilst still making it immediately recognisable as a Spitfire. So once again we hope we have captured the essence of the full size aircraft and it gives you a lot of pleasure both in building and flying.

The all wood easy build construction follows the now well proven path of other models in our range in that it incorporates a fully sheeted built-up wing with a comprehensive list of cut parts and accessories. All our kits are designed with you the builder forefront in our mind. The unique adjustable motor mount assembly means most 35mm diameter motors can be accommodated within the cowl. With a typical 4/500w 3542 motor using a 3S 22/2900mA LiPoly battery the Spitfire has a sprightly performance and is capable of performing a wide variety of manoeuvres. It is both a delight attracting compliments on both fronts.

Radio Equipment Required

The recommended radio equipment required for the Spitfire is two metal geared micro servos i.e. Hitec [HS82MG / JX-PS1171MG](#) or the Ripmax Quartz 204 digital for the Ailerons plus two standard size servos for the Rudder & Elevator with a 4/6 channel receiver. Whilst a 4ch receiver will suffice a 6ch Rx is recommended to avoid using a Y lead which can pose aileron / electronic setup problems.

Electrical Power Train

The Spitfire requires a 3542 Brushless motor rated at 400-500w and 1000 – 1300 Kv. A 50/60A Speed Controller (ESC) and a 2200 / 2900mAh 3S LiPo battery. The prototype used an Overlander 3542/05

1250Kv motor with a 50A ESC, 10x6in APCE propeller and an Overlander 2200/2900mAh 3S 35C LiPos. With this set-up the Spitfire is more than adequately powered with typically flight duration of up to 10 minutes. If you use a different specification motor or a 4S battery then a different size propeller should be used. If you are unfamiliar with model electrics then please read the articles on our website www.phoenixmp.com.

Tools / Materials Required

The tools required to build the Spitfire are building board, recommend 10mm Sundela board, (ideal for sticking pins in) a modelling knife with spare blades, a 2ft / 1 Metre Straight Edge, 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 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.

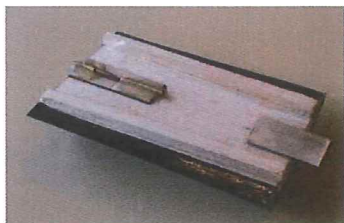
Please Note: PVA is the recommended glue for nearly ALL wood joints, particularly when building the wing. Also for maximum glue joint strength we recommend lightly sanding laser cut edges before gluing.

Building the Fuselage

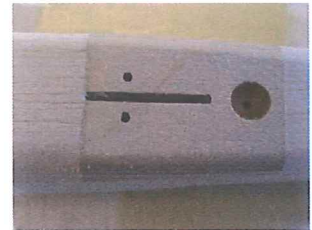
1. Glue the fuselage extensions to the sides to complete fuselage sides.
2. Using a *spirit* based contact adhesive such as that the carpet fitters use to glue the ply nose doublers in position ensuring there is a **left and right** side.
3. Use weights to hold the fuselage sides flat whilst the glue sets
4. Mark out the position of formers F2 & F3 on the inside of the fuselage sides.
5. Glue triangular strips along top and bottom edges of fuselage.
6. Glue wingseat and spruce Hatch sport strip in place.
7. Sand edges of fuselage sides with 180 grade Wet & Dry to provide a good gluing surface for top and bottom structure.
8. Using wing dowels carefully aligning and glue F2 & F2A glue together. Clamp and remove dowels before glue sets.



9. Fit 12mm Tail post block.
10. Dry assemble fuselage sides upside down over plan and position formers F2 & F3
11. Taper Tail post to provide to match opposite side when joined.
12. After ensuring the fuselage is properly aligned and all square glue formers F2(A) & F3 in position. Use rubber bands and weights to aid alignment whilst the glue is setting. *Tip.* Suggest this is done over the plan after marking the centres of formers for reference.
13. Glue join fuselage at the tail.
14. Whilst fuselage is still located over plan fit Motor former F1. When glue set fit front Hatch block.
15. Glue Tailplane in position checking that it is square in all three axis (XYZ). Use thin length of thread pinned to middle of hatch front to check the distance is equal to the same point on both sides of the Tailplane.
16. Glue 12mm sheet top decking in place and sand / trim to shape. Checking that when the Fin is fitted it aligns with the centre line of the fuselage.
17. Fit cockpit floor. Note 3mm sheet is *crossgrain*.
18. Install control snakes. Anchor to fuselage side every 100mm using scrap balsa continually checking for free movement of the control snake. *Tip.* Drill small hole 75mm back from hinge line and angle the exit hole for free travel using small file.
19. Fit spruce wing backstop.
20. Fit 6mm rear fuselage bottom sheet plus 6mm ply Tail wheel mount.
21. Do **NOT** glue 10mm bottom sheet between F1 & F2 in place. Reason. Wing Dowels holes in F2 used to drill Wing dowels hole in Wing.
22. Glue balsa motor back plate to 4mm ply motor mount.
23. Glue 6mm motor dowels and 4mm washers in place on F1. To assist alignment slide motor mount into position whilst glue is setting.
24. Mount fuselage over plan and glue F1 in position.
25. Glue 10mm triangular strip reinforcement to ply formers.
26. Glue 6mm sheet wedge in position between F1 & F4 checking that rear faces align with each other square with the fuselage sides.
27. Glue 12mm sheet rear end of hatch in place.
28. Install control cables. Anchor to sides every 100mm with balsa bridges made from scrap.



29. Fit 3mm cross-grain Cockpit floor.
30. Construct Hatch as per diagram. Use extra ply end supplied to wedge hatch in place whilst sanding to leave a gap for the covering.
31. Sand nose to shape with hatch in-situ.
- 32. Build Wings.**
33. Mount M5 Tee nut into 10mm balsa block and glue to mounting plate.
34. Determine position of Wing bolt relative to the fuselage and glue wing bolt plate wedges mid position.
35. With the wing in position slide bolt plate backwards and forwards to align Tee Nut with wing bolt.
36. Fit Rudder and Elevator servos as indicated on plan using supplied servo bearers.
37. Fit 10mm front bottom sheet between F1 & F2 in place and sand to shape.
38. Assemble and mount motor. Fit motor cowl and adjust motor position as required.
39. Glue motor mount in position. Use M3 washers to achieve Sidethrust and Downthrust.



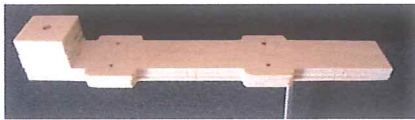
Building the Wings

1. To protect the plan cover in thin polythene.
2. Join 1.5mm wing sheeting. Lightly trim edges to make a good joint. Using Sellotape to hold sheets a together whilst glue is setting. **Note:** Bottom sheet has UC and servo bay cut-outs. Top sheet only has servo lead exits.
3. Glue ply servo exit support in place on the underside of top sheeting. Check you have a left and right panel!
4. Accurately align bottom leading edge sheet on plan and pin in position. Note the sheet overhangs front and back of ribs.
5. Mark position of 3mm mainspar.
6. Glue mainspar in position. Pin straight edge behind mainspar to keep it straight.
7. Assemble 6mm ply undercarriage and place in position along with ribs.
8. Pack up sheeting front and back to follow rib contour.
9. Glue undercarriage plates in place in conjunction with adjacent ribs to aid alignment.
10. Glue remainder of ribs in position but NOT W1.
11. Check that aileron servos fit servo mounts. Adjust as necessary. Snug fit!



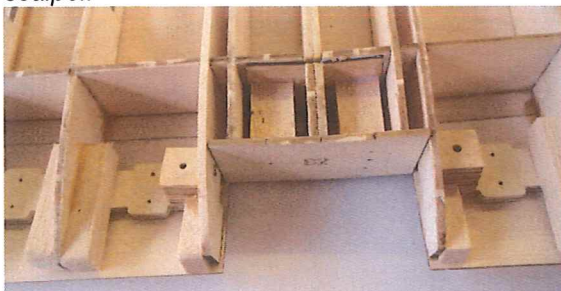
12. Assemble and glue wing servo mounts in position checking orientation. Assemble and mount in wing with glue still runny to allow alignment.

13. Glue 6mm square strip to top of main spar between ribs.



14. Build second wing.

15. Join wings over the building board.
16. For Dihedral place 40mm blocks under mainspar at each tip.
17. Glue 1.5mm ply Dihedral Brace in place.
18. Glue 3mm sheet in between W2A. Trim to size.
19. Cut rear of W1 x2 to size Glue in place.
20. Repeat for front of W1.
21. Glue 15mm sq. wing dowel blocks in position.
22. Remove dihedral blocks from tip.
23. Using undercarriage plate holes as a guide drill 1.5mm pilot holes through bottom sheet to assist in locating screw holes for UC saddle clamps.
24. Thread string from servo bay through to centre section of each wing. Leave a reasonable amount of slack each end.
25. Pin one wing panel by the corners to the build board use distance pieces to support leading and trailing edges. Mark position of blocks for use on other wing.
26. Check the wing is not being twisted.
27. Fit wing top sheeting.
28. Repeat for second wing panel using support blocks used on 1st panel.
29. Using David Plane / 180 grade Wet & Dry sand wing sheeting back to ends of ribs.
30. Place 20mm wide Sellotape along the edges top and bottom of the wing sheeting. *Tip overlap tape by 5-10mm and trim with sharp scalpel.*

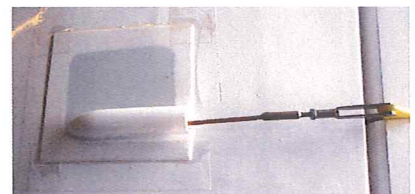


31. Using masking tape fit leading and trailing edges to wing and sand to shape.
32. Glue ply Tip Ribs to Tips. Check there is a left and right!! Thick Superglue can be used.
33. Roughly carve tips to shape.
34. Glue Tips to wing and sand to shape.
35. Glue centre section trailing edge in position.
36. Cut ailerons to length and tape in position aligning aileron trailing edges with TE wing tip.
37. Shape centre section to align with aileron TE.
38. Fit ply ends to ailerons and centre section. All approximately 0.8mm for covering material.
39. Place Sellotape on ends of 4mm ply dowel plate and tape in position.

40. Glue 3mm sub rib to inside face of F2A.
41. Remove Wing Dowel plate.
42. Offer wing up to fuselage and check fit. Without 0.8mm ply sub-ribs the gap should be a minimum 2mm allowing for covering. Adjust thickness of 3mm sub-rib as necessary.
43. Fit 0.8mm ply sub-rib facing.
44. Make minor adjustment to wing seat as required.
45. Drill wing bolt hole and glue ply washer in place.
46. Run thin Superglue around wing bolt hole to stiffen it.
47. Using PVA, glue 4mm ply wing dowel plate in position.
48. Whilst glue is still wet place wing on fuselage and push the wing dowels through front of F2 to locate in holes in the dowel plate.
49. Check the wing is seated properly on fuselage. Remove wing dowels trying not to move dowel plate. Allow glue to set.
50. Drill holes for 6swg Brass wing dowel tubes.
51. Epoxy brass tubes in place.
52. Check servos for serviceability and centre.
53. Install Aileron servos checking they are operational after fitting.
54. Determine position for slot for Aileron control horn.
55. Cut slot for Aileron control horn. Must be a snug fit. Glue in place with thin Superglue after covering.
56. Give wing final sand using 320 grade Wet & Dry. Remove dust with brush and vacuum cleaner.
57. Before covering trim the thin **WHITE** canopy to size to make a template for the clear canopy.

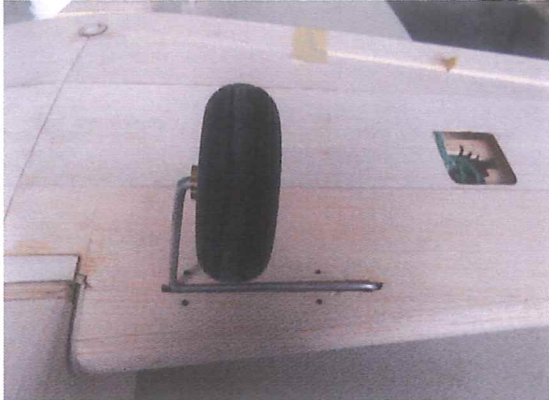
Covering & Finishing

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. Also position aileron servo arms so they do not protrude above wing surface.
4. Please follow the instructions 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

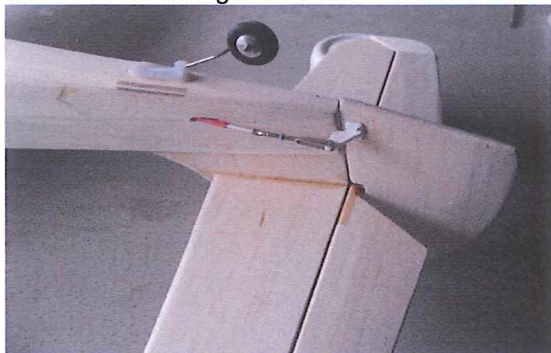


tack along its length before sealing all along the edges and shrinking with a Heat Gun.

5. Superglue Aileron control horns in position and top hinge Ailerons using Sellotape Clear (UV resistant).
6. Centre Aileron servos using transmitter sub-trim and adjust Aileron pushrods. When satisfied tape servo covers in place.
7. Trim canopy to fit. Glue pilots in position and fit canopy using canopy glue. Cover edges of canopy with 12mm wide self adhesive trim tape.
8. Fit undercarriage and motor and tail wheel assembly etc.



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. Exponential is recommended for both Aileron and Elevator controls. Typically 30%. Balance Point 40mm back from the rear of F2. If using 2.4Ghz R/C equipment (recommended) it is imperative you re-bind / pair the receiver to update failsafe settings after set-up and before flying your Spitfire. Note the throttle stick MUST be in the low throttle position when carrying out this operation. Also check that when there is a loss of Tx signal the motor shuts down. Failure to do this has resulted in a number of serious accidents!!! Remember the Transmitter is first ON and last OFF! After landing always disconnect the battery on retrieving the model BEFORE switching off Tx.



11. A few simple rules for electrics. In flight it is normal for the battery, motor and speed

controller (ESC) to get warm but if they get hot then the reasons could be insufficient cooling, too large a propeller or the battery / ESC too low component specification. For the battery it could be due poor condition, too low a 'C' rating allied to lack of capacity. To avoid discharging the battery below the recommended voltage always land when you notice there is a power loss on full throttle or on timer alarm. When landing in foliage cut the throttle immediately to avoid burning out the speed controller / motor. Before and after each flight is advisable to check battery capacity (charge state). Remember if any of the cells fall below 3v this can result in permanent damage to that cell / battery pack.

Flying

When satisfied the model is set-up and ready to go choose a suitable site and day to test fly i.e. wind not too strong or turbulent. If you are inexperienced please seek assistance for the maiden flight. If set up correctly very little trimming should be required although some down elevator compensation may required at full throttle to control the rate of climb and a touch of right rudder on takeoff. The Spitfire, as previously mentioned, is a lively model and capable of any manoeuvre expected of this type of model including inverted flight and multiple rolls etc. Finally we hope you have enjoyed building the Spitfire and it gives you many hours of pleasurable flying. I have enjoyed developing the Spitfire kit.



Happy landings,

Stan

30-Jun-23