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ENIGMA



ELECTRIC and GLOW VERSION

Evolution Models Kits Include:

Precision Laser Cut Balsa, Ply and Depron
High Quality Comprehensive Hardware Pack
All Sheet and Strip Wood
Comprehensive Step by Step Instruction Manual

V2

Recommended Setup

35-46 cu. in. Glow or Electric Equivalent
Four Micro Servos (JP Supatec MG 2BB) + Throttle

Introduction

The Enigma is a lightweight highly manoeuvrable model designed for the sport flyer or aerobatic pilot. The airframe is strong and robust, but lightweight enough to perform any manoeuvre you desire with precision and ease. We know you will not be disappointed with the performance of the Enigma and we also hope that we have also designed a model that is simple and satisfying to construct.

If you wish to give us any feed back please do so at support@evolution-models.com

We hope you enjoy the Enigma as much as we have here at Evolution Models.

Building Recommendations

Check all parts from the box to ensure that they are present; if not then please contact us at the e-mail address at the back of the instructions. We do, from time to time, make mistakes!!

Ensure that you use a completely flat base on which to build the model, this should be large enough the build the wing 50" (1270mm) x 16" (400mm) as a minimum.

Read through the instructions before starting to build, understand each step before applying glue. Take your time building the model, building a straight and strong model will ensure it will fly well! We know the instruction booklet is large, but it is mainly pictures and illustrations to provide clear concise construction steps.

The glue detailed in the instructions is for guidance only; this is what we used for the prototypes. It is at the builder discretion which glue is used but ensure that it is suitable for the intended purpose. **Always** read the application instructions to ensure you achieve a strong joint. Depron is a foam material, standard Cyano will attack and melt it, **always** use foam safe glue. Aliphatic Wood Glue is recommended if the joint may require sanding. Aliphatic white wood glue sands at the same rate as the balsa and therefore will not leave any glue lines.

Once you have removed the laser cut part from their sheets keep the remaining sheets, some of this will be used throughout the build process.

Balsa is a hardwood and therefore a mask should always be worn when any sanding is required. Make sure the mask provides suitable protection from hardwood or airborne dusts. We also suggest you sand outside in free air away from anyone else.

This radio-controlled model is **not** a toy. It can cause serious injury to the operator, public and property if misused or abused. Ensure that you carefully read all the instructions supplied with this kit and instructions provided with the engine and radio control system or any other components purchased separately. Also make sure that any parts bought separately are suitable for their application.

This kit contains small and potentially sharp parts, keep away from children.

Additional Materials Required	Recommended Tools
Uhu Por	Modelling Knife
Foam Safe Cyano	Razor Plane
Standard Thin or Medium Cyano	Set Square
Aliphatic Wood Glue	Sand Paper
Epoxy Resin	Sanding Block
Tinned Copper Wire (For Undercarriage)	Blow Torch
Solder	Drill and Drill Bits
Heat Shrink Covering Material	Pop Rivet Gun
Engine and Mount (ESC for electric variations)	Building Board – Completely flat 1300 x 400mm Min
Radio Gear	Bradawl

Enigma Part List

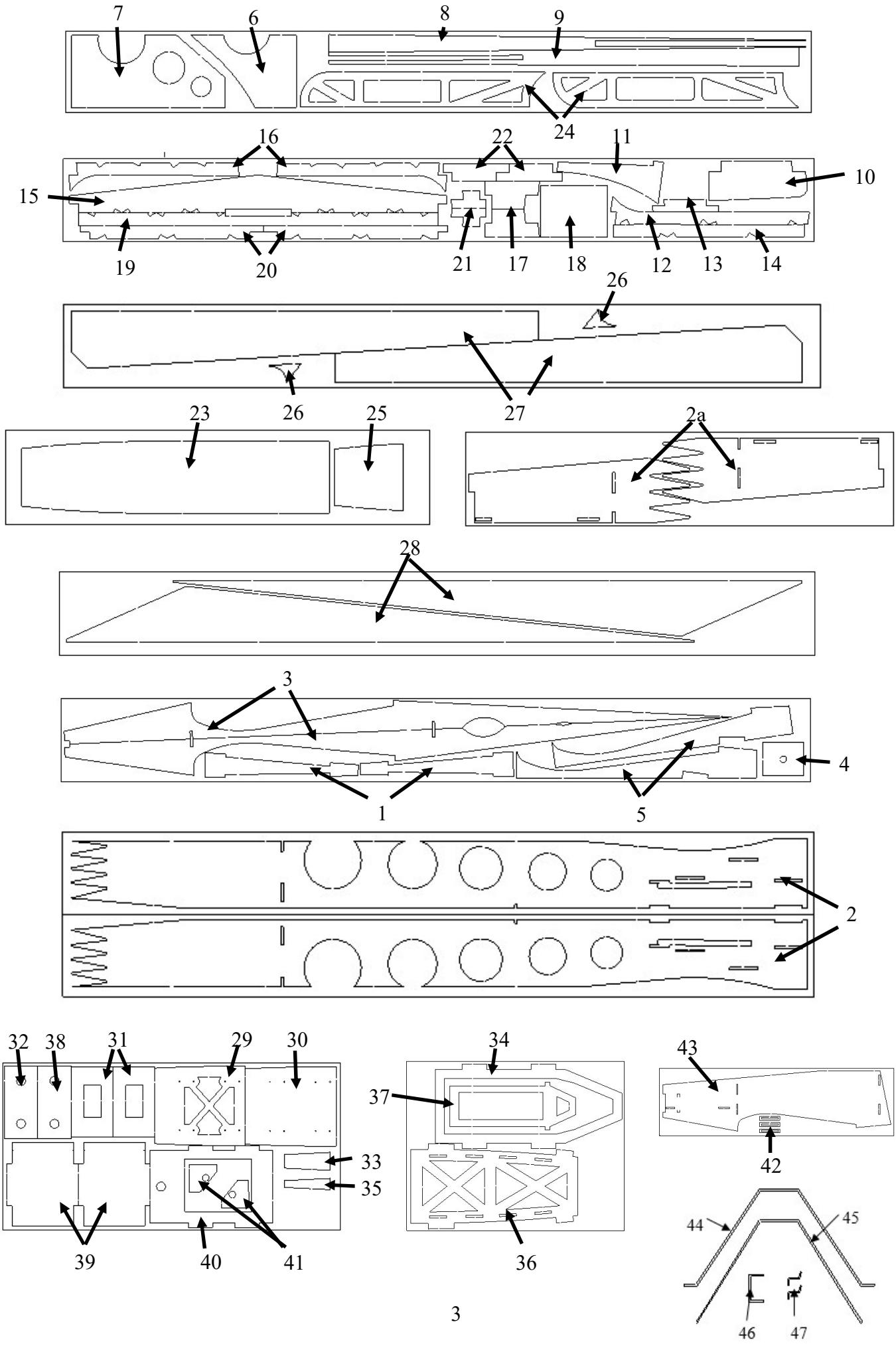
Wood Pack

Sheet Metric (mm)	Sheet Imperial (in)	Quantity	Description
1220 x 100 x 1.5	48 x 4 x 1/16	2	Leading and Trailing Edge Sheeting
915 x 100 x 1.5	36 x 4 x 1/16	1	Webbing
915 x 100 x 1.5	36 x 3 x 1/16	1	Wing Centre Sheeting
915 x 75 x 3	36 x 3 x 1/8	1	Bottom, Top Deck Sheeting and Wing Tips
Strip Metric (mm)	**Strip Imperial (in)**	**Quantity**	**Description**
1220 x 25 x 6	48 x 1 x ¼	1	Leading Edge
1220 x 9.5 x 6	48 x 3/8 x ¼	3	Main and Trailing Edge Spars
915 x 9.5 x 6	36 x 3/8 x ¼	2	Tail plane, Rudder, Elevator Strip
915 x 6 x 1.5	36 x 1/4 x 1/16	5	Wing Capping
500 x 6	36 x ¼ Dowel	1	Elevator Pushrod

Hardware Pack

1	Tail Wheel Assembly	1			
2	Horns	5	**6**	Wing Bolt	2
	Horn Backs	3		Captive Nut	2
	Horn Bolts	8		Dowel (110mm)	1
	Horn Nuts	8			
			7	Mylar (20cm)	1
3	Closed Loop Wire	1.8m			
	Metal Clevis	6	**8**	Hatch Latch Magnets	2
	Plastic Snap Link	2		Washers	2
	CL Adaptors	2			
	Crimps	4	**9**	Hatch Mount 1/4 x 1/4 Spruce	1
	CL Lock Nuts (M2)	6			
4	Threaded Rods	4			
5	Saddle Clamps	4			
	Screws 6 x 3/8	8			
			10	Stickers	2

Parts Identification

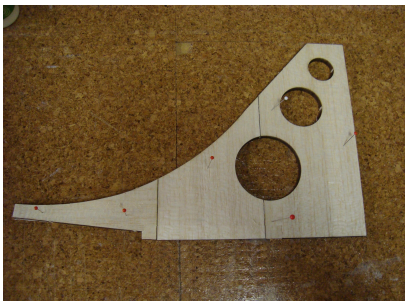


Part No.	Description	Quantity	Sheet Size
1	Tailplane / Fin Support	2	3mm (1/8") Balsa
2	Left and Right Upper Fuselage Sides	2	3mm (1/8") Balsa
2a	Left and Right Upper Fuselage Sides	2	3mm (1/8") Balsa
3	Left and Right Lower Fuselage Sides	2	3mm (1/8") Balsa
4	Wing Centre Web	1	3mm (1/8") Balsa
5	Wing Doublers	2	3mm (1/8") Balsa
6	Fin Rear Section	1	6mm (1/4") Balsa
7	Fin Centre Section	1	6mm (1/4") Balsa
8	Upper Backbone	1	6mm (1/4") Balsa
9	Lower Backbone	1	6mm (1/4") Balsa
10	Rudder Base	1	6mm (1/4") Balsa
11	Fin Front Section	1	6mm (1/4") Balsa
12	Rudder Trailing Edge	1	6mm (1/4") Balsa
13	Rudder top	1	6mm (1/4") Balsa
14	Rudder Leading Edge	1	6mm (1/4") Balsa
15	Tailplane Leading Edge	1	6mm (1/4") Balsa
16	Elevator Trailing Edge	2	6mm (1/4") Balsa
17	Elevator Inner Tips	2	6mm (1/4") Balsa
18	Tailplane Centre Section	1	6mm (1/4") Balsa
19	Tailplane Trailing Edge	1	6mm (1/4") Balsa
20	Elevator Leading Edge	2	6mm (1/4") Balsa
21	Elevator Outer Tips	2	6mm (1/4") Balsa
22	Tailplane Tips	2	6mm (1/4") Balsa
23	Fuselage Top	1	6mm (1/4") Balsa
24	Wing Tips	2	6mm (1/4") Balsa
25	Fuselage Bottom Front Section	1	6mm (1/4") Balsa
26	Aileron Tips	2	6mm (1/4") Balsa
27	Ailerons	2	6mm (1/4") Balsa
28	Upper Fuselage Sides	2	3mm (1/8") Balsa
29	U/C Inner Plate	1	3mm (1/8”) Ply
30	U/C Outer Plate	1	3mm (1/8”) Ply
31	Aileron Servo Mounts	2	3mm (1/8”) Ply
32	Wing Mounting Plate (Fuselage)	1	3mm (1/8”) Ply
33	Tail Skid Inner	1	3mm (1/8”) Ply
34	F3	1	3mm (1/8”) Ply
35	Tail Skid Outer	1	3mm (1/8”) Ply
36	Battery Mounting Plate	1	3mm (1/8”) Ply
37	F4	1	3mm (1/8”) Ply
38	Wing Mounting Plate (Wing)	1	3mm (1/8”) Ply
39	F1	1	3mm (1/8”) Ply
40	F2	1	3mm (1/8”) Ply
41	Hatch Magnet Bracket	2	3mm (1/8”) Ply
42	Control Exit Doublers	3	1mm (1/32”) Ply
43	Fuselage Doublers	2	1mm (1/32”) Ply
44	U/C Front Leg	1	3.5mm (10swg) Wire
45	U/C Rear Leg	1	3.5mm (10swg) Wire
46	Elevator Joiner	1	3.5mm (10swg) Wire
47	U/C Strengtheners	2	3.5mm (10swg) Wire

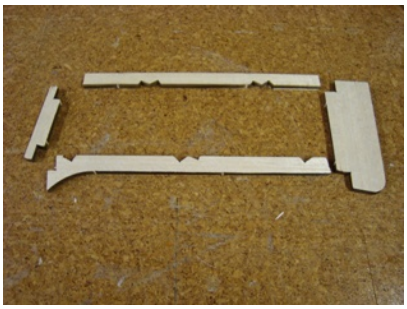
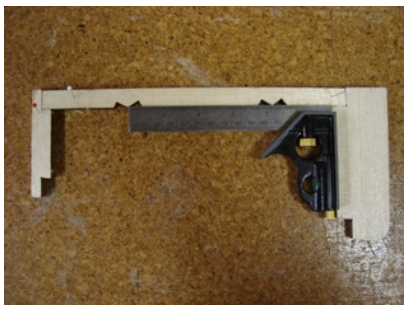
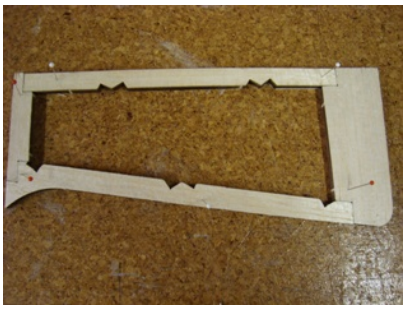
Building Instructions

FIN AND RUDDER

Take the three parts that form the fin (Parts 6, 7 and 11), trial fit before gluing together. The bottom of the fin will be trimmed down later to match the rudder height in final assembly.

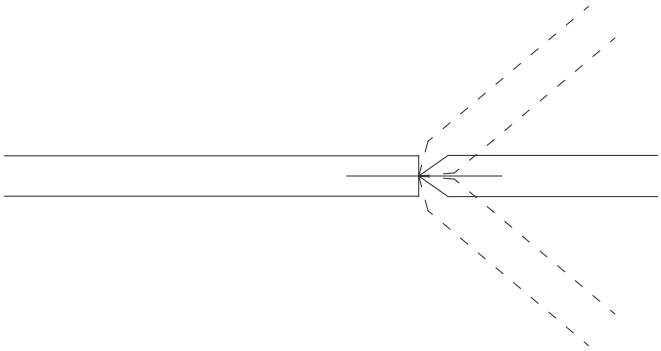



Remove the four pre-cut parts (Parts 10, 12, 13 and 14) of the rudder from the cutting sheets; trial fit the parts before gluing together using white wood glue. Ensure that the leading edge, top and bottom rails are at 90° then add the trailing edge.

Take the supplied strip of 9mm (3/8”) x 6mm (1/4”) and cut to length to form the four centre rails. Mark a centre line on the leading edge and chamfer to a 45° angle with a razor plane to make the pivot point into which the hinges will be inserted.

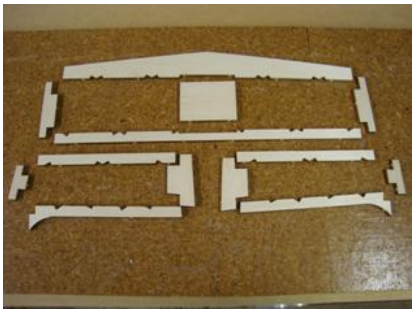
With a sharp knife cut the slots for three hinges 15mm (5/8”) from the top and bottom. Cut 10mm (3/8”) strips from the supplied Mylar hinge material and insert into the hinge slots; 50% in the rudder and 50% into the fin. Ensure that you get at least 45° free movement either way.

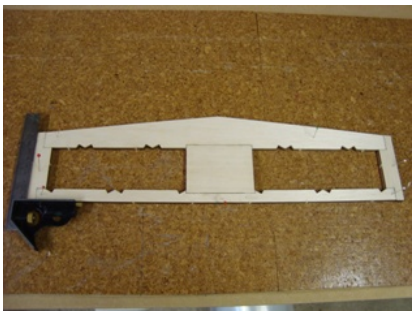


Do not glue the hinges in at this stage! Sand all parts to a smooth finish and round off the leading edge of the fin ready for covering.

TAIL PLANE

Take the five laser cut parts (Parts 15, 18, 19 and 22(2)) and trial fit. Ensure the tips are at 90° to the leading and trailing edge before gluing with white wood glue.

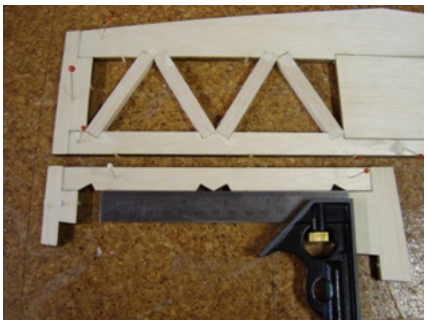
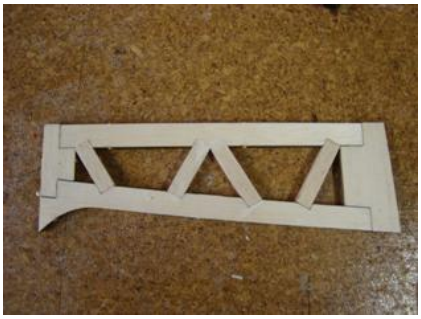




With the supplied strip of 9mm (3/8”) x 6mm (1/4”) cut to length to form the eight centre rails, glue in place with white wood glue.



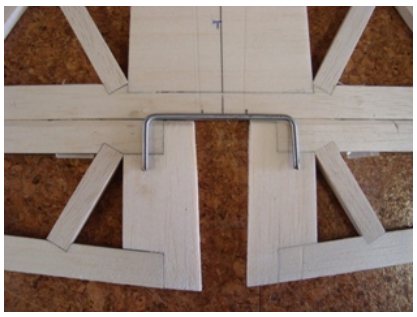
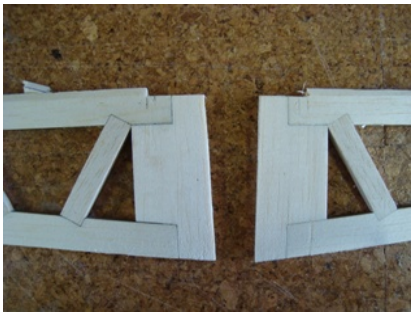
Take the eight pre-cut parts (Parts 16(2), 17(2), 20(20), 21(2)) which form the elevators, trial fit, ensure the tips are at 90° to the leading and trailing edge before gluing. With a supplied strip of 9mm (3/8”) x 6mm (1/4”) cut to length to form the six centre rails, glue in place with white wood glue.

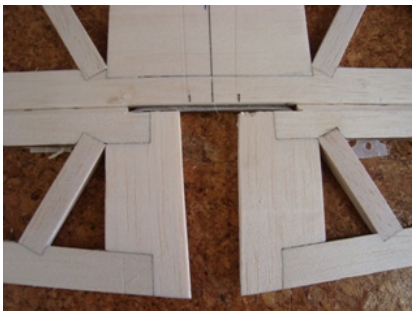



Mark the centre line of the leading edge with a pencil and chamfer either side to a 45° angle with a razor plane to make the pivot point into which the hinges will be inserted. Mark the centre of the trailing edge and carefully chamfer the elevator to a 1mm point from the leading edge.

With a sharp knife cut 2 slots in each elevator to accept the hinges, ensure that the elevator sits centrally on the tail plane. Cut 10mm (3/8”) strips from the supplied Mylar hinge material and insert into the hinge slots, 50% in the elevator and 50% into the tail plane. Ensure that you get at least 45° free movement either way as the rudder is set out above.

With the elevators hinged to the tail plane place the joiner (Part) centrally on the elevator and mark its position, cut the leading edge off up to the outer mark to allow the joiner to be recessed into the elevator and drill a hole centrally into the elevator. Make the hole slightly larger than the coupler for adjustment later.

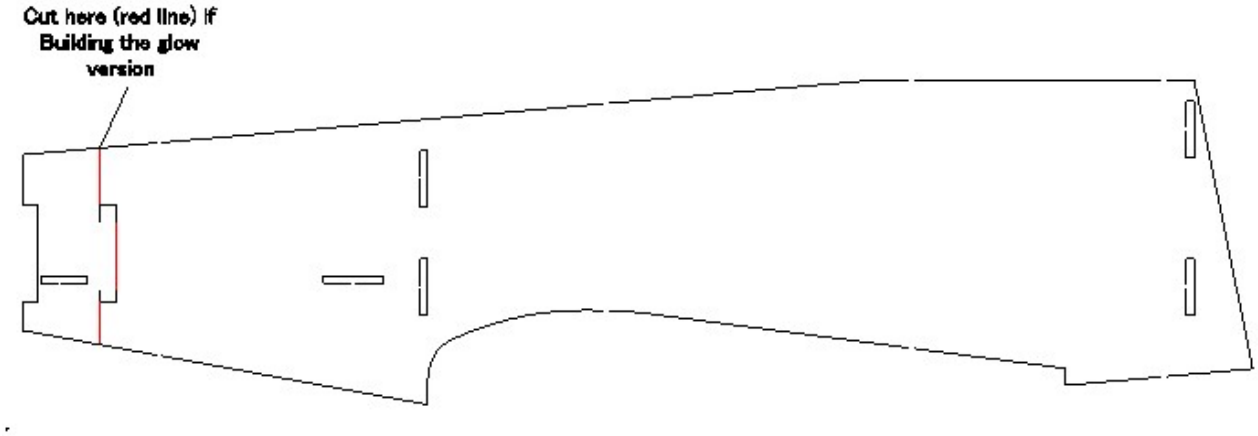



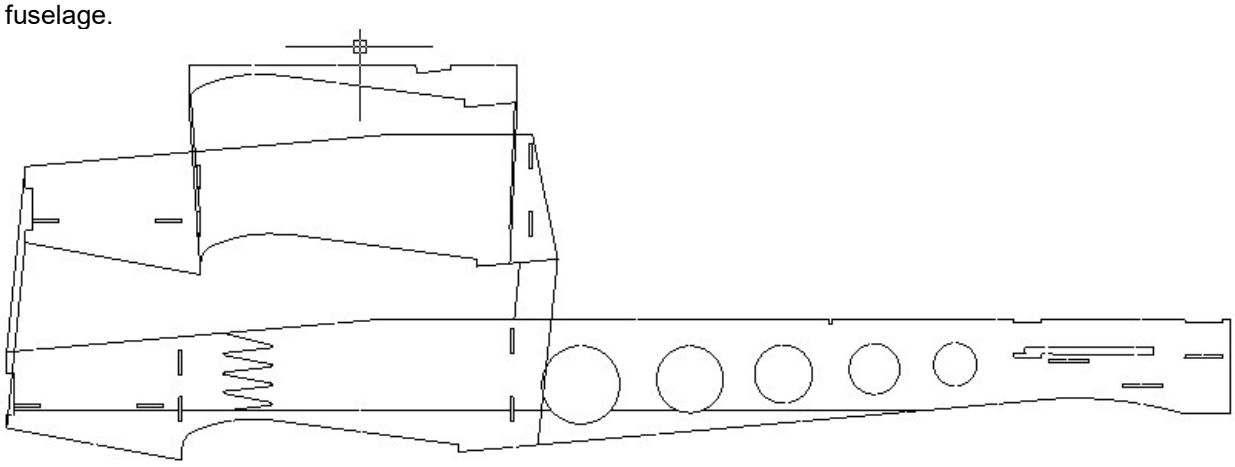
<u>Do not glue the hinges or coupler in at this stage.</u> Sand all parts to a smooth finish and round off the leading edge of the tail plane ready for covering.

FUSELAGE

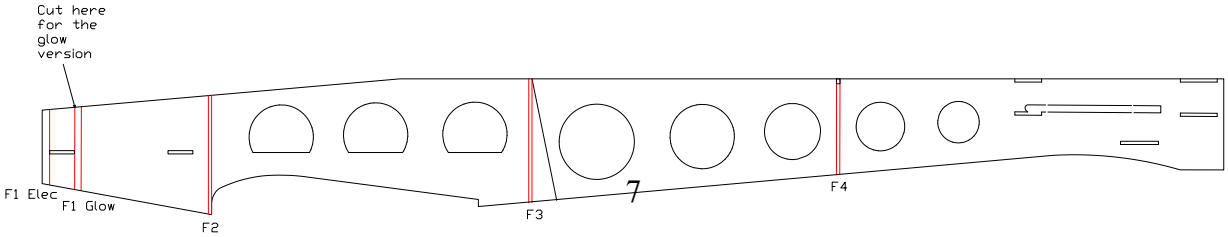
At this point the decision needs to be made whether the glow or electric version is being made. If the <u>glow version</u> is your choice then the balsa nose section and ply doubler need to be cut as shown below. Carefully cut these sections off with a straight edge and sharp knife.

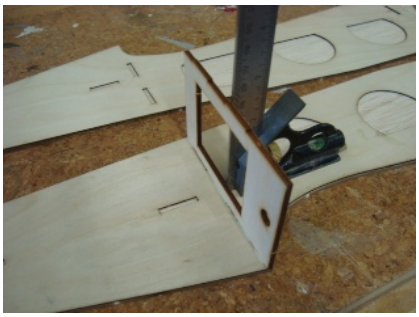


Lay the upper and lower main fuselage sides (Parts 2(2) and 3(2)) on the work bench ensuring that you have a left and right hand side. Make sure there is a good glue joint between these sections; if required lightly sand the mating edges to achieve this. Once satisfied these sections are properly aligned glue together and add the 1mm (1/32") ply doubler (Part 43 (2)) with a thin layer of white wood glue. Make sure the entire doubler has glue on it and weigh down to allow dry. Glue the control exit doublers (Part 42 (3)) to the rear of the fuselage.



Glue F2, F3, and the wing seat doublers (Parts 40, 34 and 5) in place as indicated by the cut outs marks on the ply doubler. Use a set square to ensure they are 90° to the fuselage sides. Glue the three control exit doublers (Part 42(3)) to the rear of the fuselage.







Add the second fuselage side, lining the Formers up with the cut outs. Use a set square to check that the fuselage sides are parallel on all sides, make minor adjustments if necessary. **Make time to get this right, if the sides are not parallel the model will be out of square.**



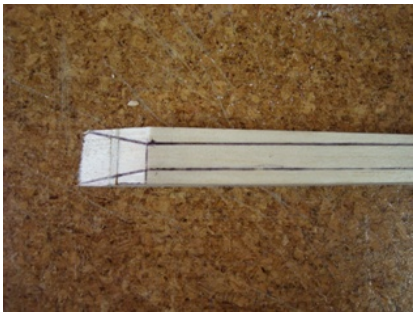
With a scrap piece of 6mm (1/4”) balsa sheet, cut a 6mm (1/4”) post for the rear section of the fuselage. Glue the fin and tail plane plates (Parts 1(2)), Former F4 (Part 37) to one side of the fuselage. Once dry, pull the fuselage sides together; the fin and tail plane plates should fit into the corresponding slots. Make sure that the sides are pulled in equally and the sides are parallel. If necessary draw a line on you work bench to ensure the sides are pulled into a centre line . **Take time to get this right or the fuselage will be out of alignment.** Once satisfied, glue in position. Former F4 should be fitted on the notches on the fuselage sides.



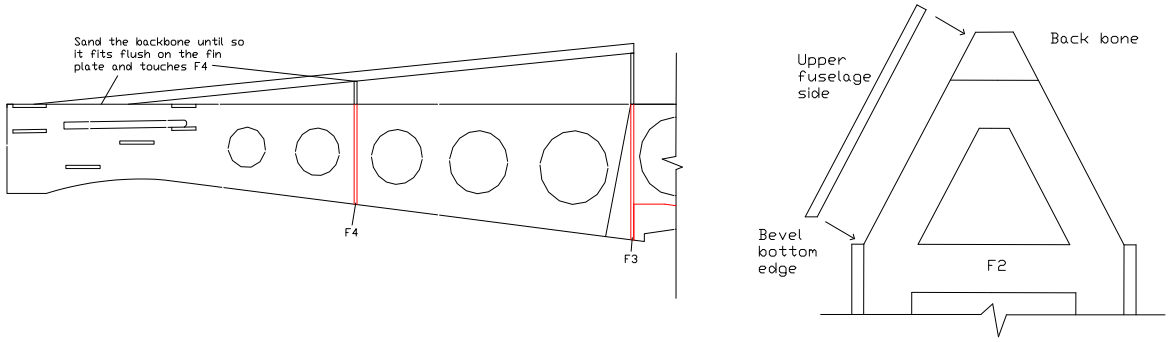

Take the upper and lower backbone (Parts 8 and 9), line up the front edge of the upper piece 12.5mm (1/2”) back from the front edge of the lower piece and glue in place. Allow to dry before moving onto the next stage. Mark a line with a pencil from the bottom of the lower backbone through the bottom of the upper backbone as shown in the right-hand picture below, carefully cut this section off.




Mark the point at the top of the front slope 6mm (1/4”) in from either edge and draw guide lines down to the rear of the backbone and front section. The lines on top taper out to the rear of the backbone (at the rear of the fin slot). With a razor plane, shape the backbone to these guidelines as shown in the picture on the right of the next page.

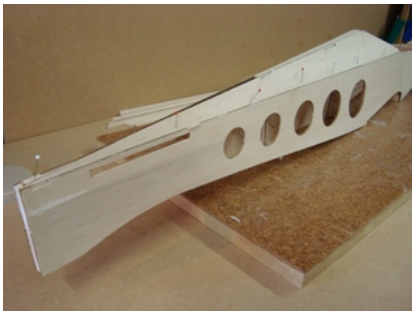



Place the backbone with the front sloping edge on F3 and gradually sand the rear section until it touches F4 as shown in the diagram below. Test fit the upper fuselage sides (Part 28(2)) and when satisfied glue the backbone in place.



With sandpaper and block or a razor plane, gently run along the bottom of the upper fuselage sides to create a bevel which will provide a better fit where they join the fuselage. See the diagram above. Once satisfied glue in place using aliphatic wood glue to make sanding easier later.

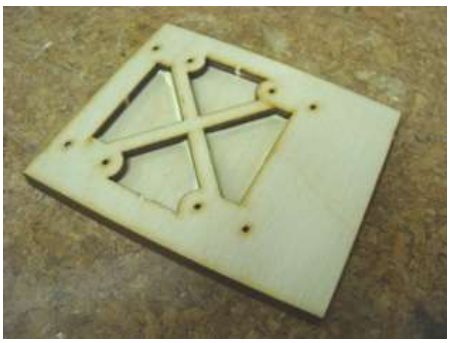




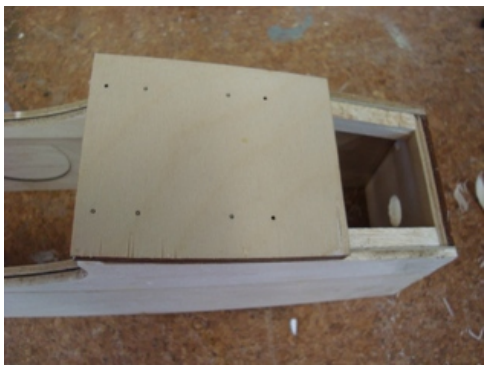
Epoxy the two F1 Former pieces together (Parts 39), these are the correct size for the glow version. If building the electric version cut F1 down so that it measures 67mm x 50mm (there are marks on one of the formers as a guide). Drill the centre of F1 if building the glow version to create a 15mm dia. Hole to allow the fuel tubing to exit the tank bay. If building the electric version place the battery retaining plate (Part 36) in its locating lugs before gluing in position with F1 using epoxy resin. Use clamps or elastic bands to hold the fuselage sides together and protect the sides using scrap balsa.




Add some scrap balsa to the area between F1 and F2 to give a greater gluing area as shown in the right hand picture below. Glue the main undercarriage plates together (Parts 29 and 30) before gluing to the bottom of the fuselage with epoxy.




Glue the undercarriage plate in place followed the bottom deck (Part 25). If you are building the **glow version** cut off the front section as shown on the right below.



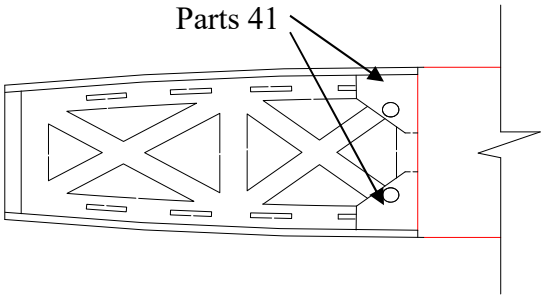

To fit the top front deck (Part 23), first cut off the front section over hanging F1 if building the **glow version**.

If building the **glow version** glue the top deck in place as shown below.



If building the **electric version** then the top deck will also form the battery hatch, cut the top deck 2-3mm in front of F2, glue the rear section in place. Take the ply hatch magnet brackets (Parts 41(2)) and glue in

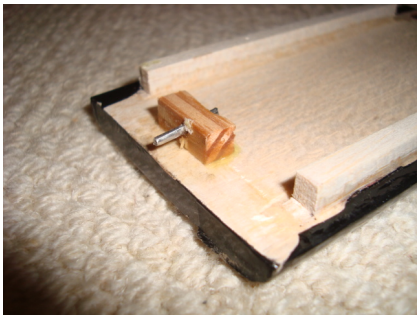
position below up against F2 and under the 2mm lip. Glue a scrap piece of ply under the hole and glue the magnet in place.



Place the washers provided on top of the magnets and push the remaining top deck down onto them to leave an imprint in the underside of the balsa, carefully carve this area to allow the washer to sit flush with the surface and maintain contact with the magnets.



Glue 6mm back from front edge of the hatch the 25 x 6 x 6mm (1" x ¼" x ¼") spruce section with epoxy, check that the hatch fits properly. Drill a 1.5mm hole through F1 into the spruce and glue a short section of the excess aileron control rod into the spruce to form a peg. The hatch is then fitted to the fuselage with the wire peg into the hole in F1 and magnets hold down the trailing edge. Using some scrap sheet to form two 'runners' to run along the edge and locate the hatch between the fuselage sides.



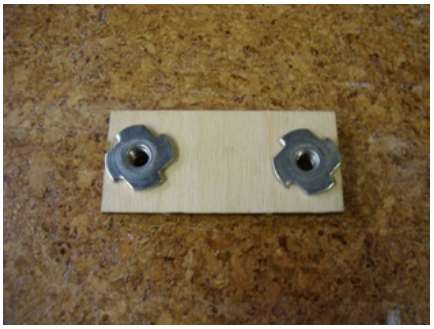
Glue together the tail wheel plates (Parts 33 and 35) and glue on the bottom rear raised section of the fuselage using epoxy resin. Part 33 should fit between the fuselage sides and Part 35 on top.



Sheet the front 'cockpit' section of the fuselage and the rear bottom deck from the rear of the wing to the tail wheel mount using the sheet of 3mm (1/8") balsa sheet supplied.



With a hammer, carefully knock the captive nuts into the wing mounting plate (Part 32), making sure the nuts are square to the plate so that the bolts will engage squarely when inserted through the wing. Glue the plate in the notch on the wing doubler plates at the predefined angle.

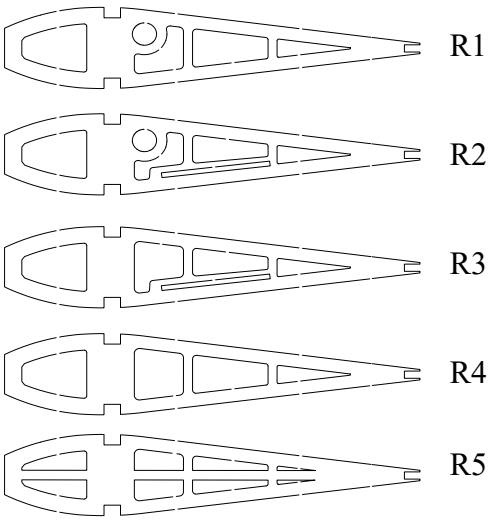




Finally sand the fuselage to a smooth finish, rounding off the backbone, front top and bottom deck. Use a fine grade paper to finish just before covering.

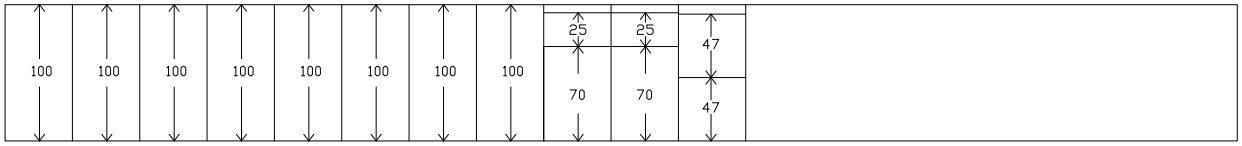
WING AND AILERONS

When building the wing make sure the ribs are the right way up, although the section is symmetrical the internal cut outs are not. The ribs are shown below in their correct orientation. *Take care to get this right!*



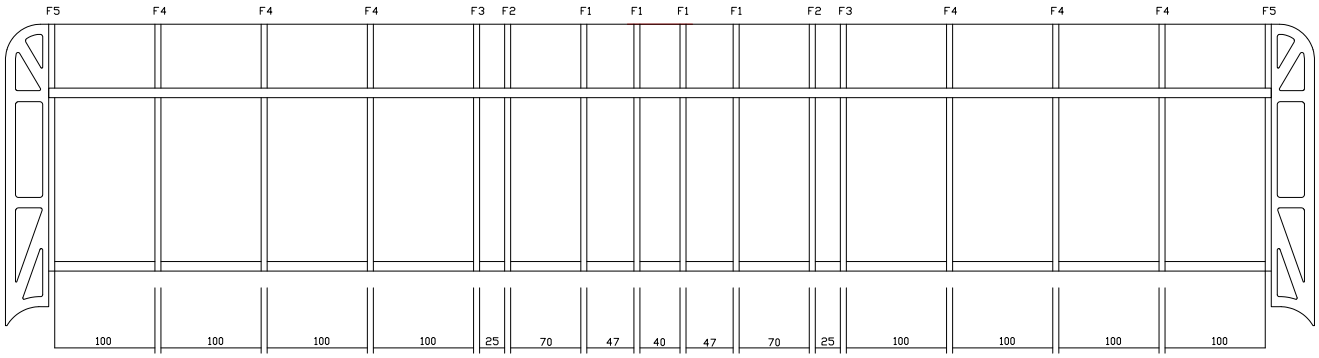
Using the supplied sheet of 915mm (36”) x 100mm (4”) x 1.5mm (1/16”) balsa, cut the webbing pieces as shown below. Each Piece should be 50mm (2”) high i.e. 8 No. 100 x 50mm, 2 No. 70 x 50mm, 2 No. 25 x 50mm and 2 No. 47 x 50mm.





Depron Wing - Webbing

Use a slow setting glue for the next few stages to give you time to align the wing. Read this section carefully first before attempting to glue (please ignore the ribs shown in the photos, these were from an earlier version. Follow the R1 – R5 guide below)



Begin building the wing by placing a 1220mm (48”) x 9.5mm (3/8”) x 6mm (1/4”) spar on the building board. Check it is straight with a straight edge and mark the centre win a pencil.

Take the centre webbing piece (Part 4) and glue this to the centre of the lower spar.



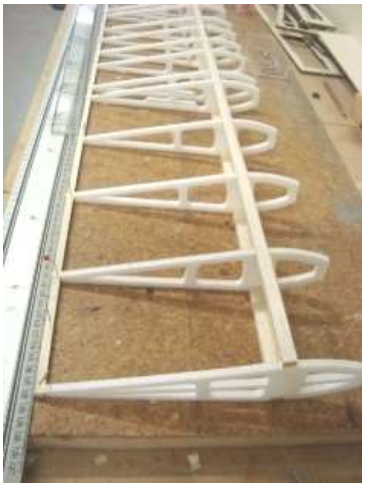


Glue the two centre ribs (R1) next to them and gradually work out evenly along the length of the wing, setting out the distances between the ribs to correspond with the diagram above. Make sure the ribs are pushed all the way onto the bottom spar then add the top spar.



Should you need to use a length of balsa to support the ribs at the trailing edge to make sure they are all aligned.

Put glue in the 'U' shaped cut out at the trailing edge (TE) and insert the TE spar (1220mm (48") x 6mm (1/4") x 6mm (1/4"). The slot may be non existent on some of the Depron ribs due to the way that they are laser cut – this is not a problem, just ensure the TE strip sits on the centre. Un-pin the main spar and allow the TE to rest on the board. Check the TE for straightness, pin it down and re-pin the main spar.

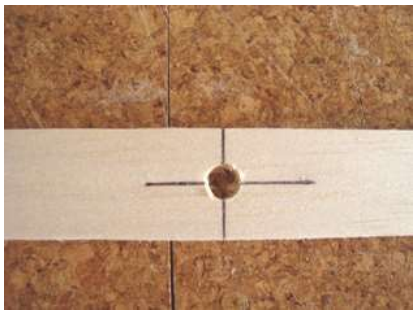
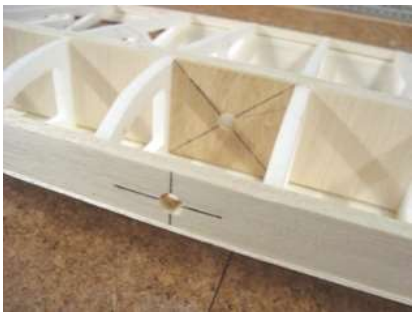
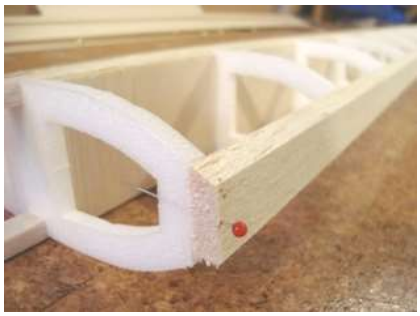


Check all the ribs are at 90° to the main spar and leave to dry. Undertaking the above in one step will ensure that the wing is true and warp free, just make sure you have enough drying time to complete the process.



Continue by drilling an 8mm hole in the centre of the 1220mm (48") x 25mm (1") x 6mm (1/4") leading edge (LE) and glue to the front of the ribs. The hole should be placed centrally on the wing in-line with the hole in the webbing piece.

Cut the leading edge flush with the end ribs and using a razor plane gradually shave the balsa down to follow the contour of the rib, as shown in the right hand picture below.

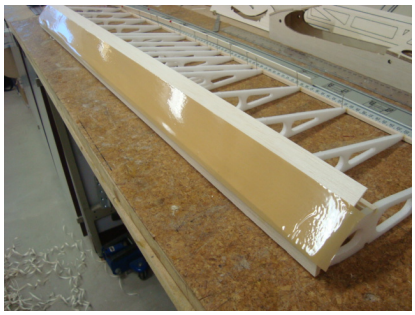
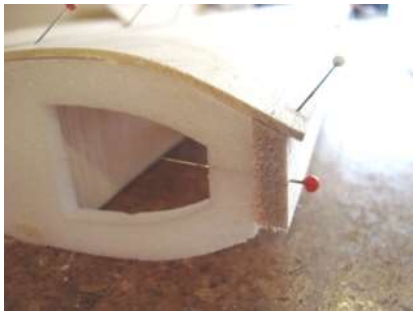




We suggest for the next stage you use aliphatic white wood glue. To sheet the leading edge take the supplied sheet of 1220mm (48”) x 100mm (4”) x 1.6mm (1/16”) an cut into two parts

1 x 1220mm (48”) x 75mm (3”) x 1.5mm (1/16”)
1 x 1220mm (48”) x 25mm (1”) x 1.5mm (1/16”)

Using the 1220mm (48”) x 75mm (3”) x 1.5mm (1/16”) apply glue from the centre line of the top spar, to the top of the ribs and LE. Place the edge of the sheet on the centre line of the top spar and securely pin it down along its length. Roll the sheet down onto the LE, and again securely pin along its length, make sure the sheet is in contact with the ribs. Using a piece of parcel tape will prevent the sheet from splitting as you roll it over the ribs. Repeat this with the remaining TE 1220mm (48”) x 25mm (1”) x 1.5mm (1/16”) sheet.

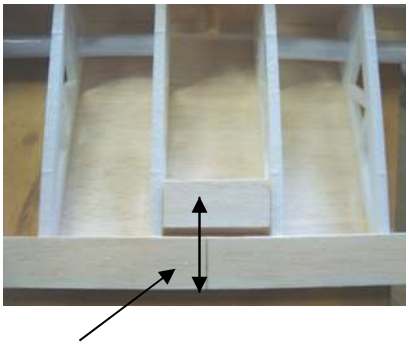
Using the supplied sheet of 915mm (36”) x 100mm (4”) x 1.5mm (1/16”) balsa sheet the centre section (across the 4 centre ribs). The remaining sheet will be used for the underside centre sheeting.


Un-pin the wing from the board and turn over, re-pin making sure that the TE is straight with a straight edge. The first three ribs on each side have holes cut into the triangular bracing; these are for the servo leads. To make the installation neater roll tubes of paper narrower than the hole, but the same length as the rib spacing. Thread the tube through holes, enlarge the diameter of the tube so it fits neatly in the hole and secure the rolled joint with Sellotape. Add a couple of dabs of glue at the rib to hold securely in place.

At the trailing edge, between the two centre ribs, pack out with scrap balsa from the sheeting to flush with the top surface. This will strengthen the area where the wing bolts are to be installed. The centre line of the bolt will be 25mm from the trailing edge so make this the centre line of the packing.





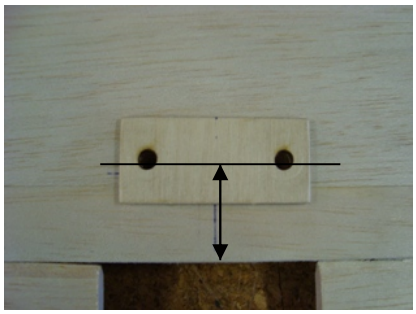
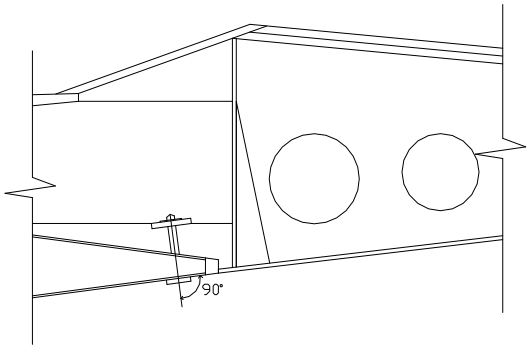
25mm from the centre of the packing to the rear of the trailing edge

Repeat the sheeting process for the bottom of the wing. Cut off any excess balsa sheet or spars flush with the end rib once the wing has dried. Shape the leading edge using a razor plane and finish while checking the fitment to the fuselage, make sure the LE is round with no flat spots.




Using the strips of 6mm (1/4") x 1.5mm (1/16") x 915mm (36") balsa cap the top and bottom of the ribs

With the wing upside down on the bench mark the centre line on the TE, measure 25mm and draw a line parallel with the TE. Mark the centre line on the wing bolt support (Part 38) and glue in position.

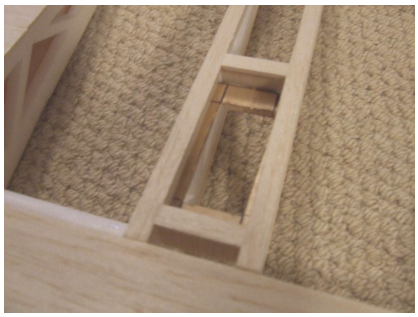
With a drill held at 90° to the wing surface carefully drill a hole through the plate and through the wing for the wing bolts. Drilling through at 90° to the plate this should precisely marry up with the internal wing nut support in the fuselage, if it does not then enlarge the hole slightly to allow for a small amount of movement to allow the bolt to locate with the nut.

Take the wing tips (Part 24 (2)) and glue on the centre line of the end rib, using the excess 1/8th sheet from the fuselage bottom and spare main sheets cut triangular supports and construct each tip as shown below. Use an off cut of 3mm (1/8") balsa for the fillet at the rear adjacent to the aileron (pictured right below).





Install the wing servo mounts (Part 24 (2)). Enlarge the hole in the centre to fit your chosen servos. Use scrap balsa at the front and rear of the mount, up to the wing surface, to create a `well`. The covering will later be cut away to mount the servo.



Take the two ailerons and tips (Parts 26(2) and 27(2)) and glue together. Mark a centre line on the leading edge and chamfer to a 45° angle with a razor plane to make the pivot point into which the hinges will be inserted. Mark the centre of the trailing edge and carefully chamfer the elevator to a 1mm point from the leading edge.



With a sharp knife cut the slots for three hinges. Cut 10mm (3/8") strips from the supplied Mylar hinge material and insert into the hinge slots; 50% in the aileron and 50% into the centre of the 6mm (1/4") trailing edge. Ensure that you get at least 45° free movement either way. **Do not** glue the hinges in at this stage! Sand all parts to a smooth finish and round off the leading edge of the fin ready for covering.

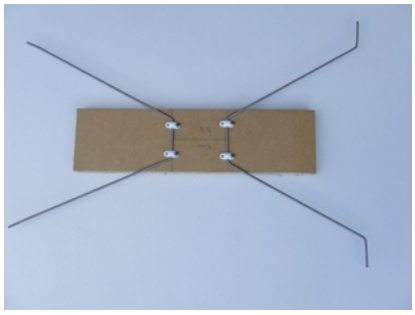
COVERING

Before covering seat the wing, tail plane and fin and make sure that they all fit. Make any alterations as necessary with fine sandpaper and a block. Finally sand all parts to provide a smooth, blemish free surface ready for covering.

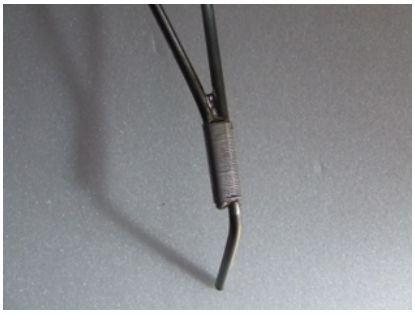
This is your chance to express yourself; unlike the ARTF models on the market you can now choose your own colour scheme. The prototype models were covered in Solarfilm, but the choice is yours. Make sure that you follow the manufactures recommendations when applying the film. We would recommend applying a surface sealant to the area around F1 so that the film adheres better in areas where it is likely to be exposed to glow fuel (glow version). We also recommend that you apply a glow fuel sealant to the tank compartment of the fuselage. Follow the manufactures recommendations when applying. Ensure when you cover the model you do not introduce any warps, cover each section and evenly tighten the covering on both sides. Ensure when you have finished covering all parts they are straight and true.

UNDERCARRIAGE AND TAILWHEEL

Draw two lines on a piece of scrap ply 40mm apart. Place the front leg and rear leg (Parts 44 and 45) on each of the lines and screw down using the supplied 10swg saddle clamps and screws. Make any minor adjustments with pliers to make sure that the legs are parallel where they are to be bound.







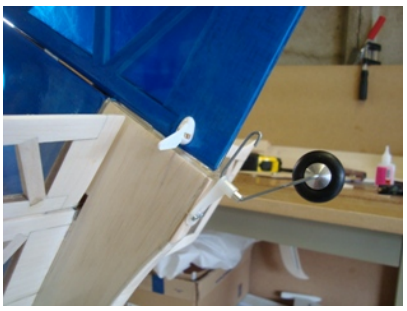
Clean the tops of the legs with sandpaper or wire wool to remove any dirt or lubricants ready to solder. Pull the legs together and adjust so that they join as shown in the photograph. Bind together using tinned copper wire.

We advise wearing gauntlets at this for this process. Heat the wire using a blowtorch and feed solder into the joint, ensuring that you flood the joint to make it strong. Clean off the excess with a damp cloth; **do not** touch the leg as it will be extremely hot. Repeat for both sides. Once cool remove from the scrap ply. Save the clamps and screws. Insert the undercarriage support pieces (Part 47(2)) in the same way as shown below.



Take the supplied tail wheel assembly and bend the wire through 90º as close the plastic bracket as possible. Create a half loop approximately 25mm from the plastic mount and cut off the excess wire. Cut off the plastic tab on the bottom of the assembly to allow the bracket to sit on the ply plate, and screw in the screws supplied.

Create the wire piece as shown in the picture below and inset into the rudder so that the two loops are approximately 25mm apart, cut a slot in the bottom of the rudder so that the wire can sit into the rudder with the loop exposed, glue in place with Cyano. Join the two loops with a rubber band once the fin has been glued in position.





Once the fuselage has been covered, line the undercarriage up with the centre of the two mounting plates. Attach the undercarriage, ensuring it is square to the fuselage with the screws provided through the pre-drilled holes. Make sure the axles are at 90° to the centreline of the fuselage. Minor adjustments can be made with pliers or mole grips, just ensure that you hold the undercarriage legs and not the fuselage when doing this to prevent damaging the fuselage.

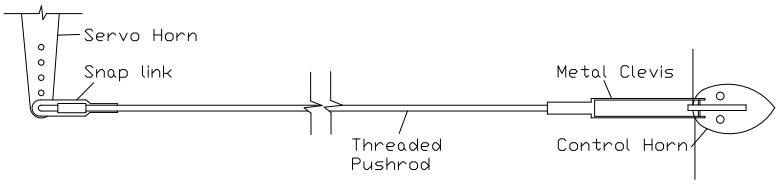
Place your chosen wheel on the axle, then fit 10 SWG collets on the axle and tighten the grub screw making sure that it rotates freely.

FINAL ASSEMBLY

Wing

Take the fully covered wings and ailerons, glue the hinges 50% into the aileron using a thin Cyano and ensure that it penetrates into the slots both top and bottom. Slot the hinges into the corresponding slots on the wing. Move the aileron full travel (min 45°) to ensure that there is no resistance and repeat the gluing process. Repeat this for the second aileron. Due to the large control surfaces we would recommend pinning the hinges, but this is left to the builder's discretion.

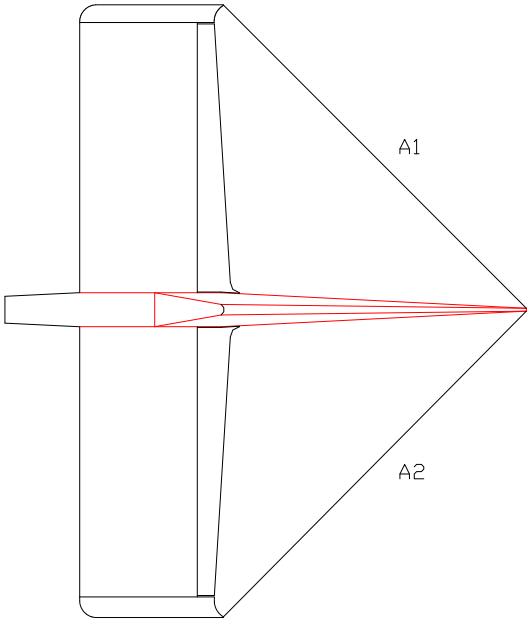
Install the servos in to the wing and feed the wires through the tubes. Pull the wires out at the centre section where the sheeting was cut earlier. Drill pilot holes and securely screw the servos into place using the fixings supplied with the servo. Centre the servo and attach a single arm horn and make up the pushrod as shown below. Install the control horn to the aileron using ht bolts and back plate as supplied.

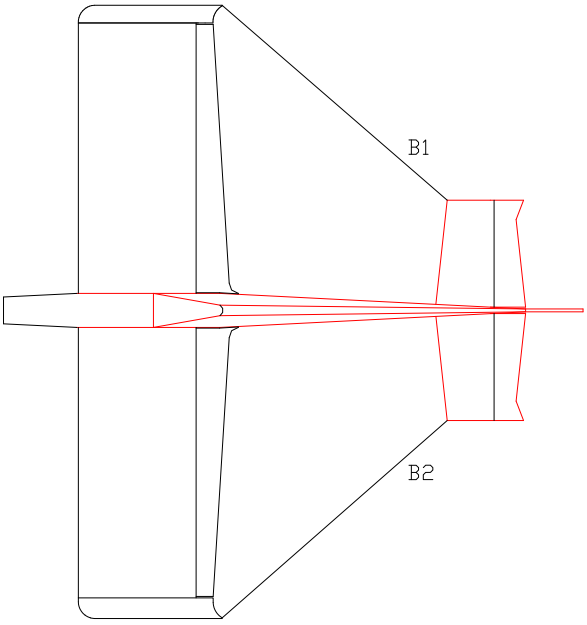


Glue the 95mm (3 ¾") wing dowel into the bottom wing and cut to size so that 10mm extends from the wing

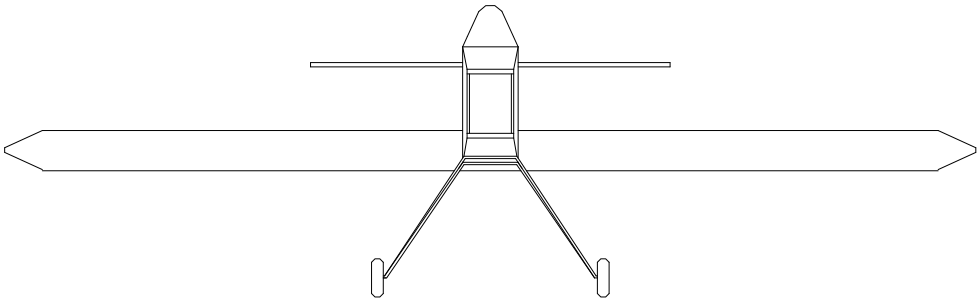
Fuselage

Fit the wing to the fuselage so that it is firmly seated, but able to move for minor adjustment. With a tape measure check that the fuselage is square to the wing as per the diagram. Ensure A1 = A2.

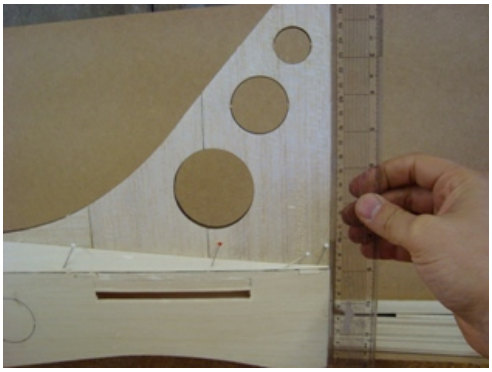




Insert the tail plane into its slot and check the measurement B1 = B2. Once satisfied that the tail plane is square, mark with a pencil both top and bottom along the edge of the fuselage. Remove the tail plane from its slot and carefully cut 1/16" (1.5mm) on the inside of the line. To remove the covering film from both the top and bottom, and glue into place making sure it is parallel to the wings.



Check the fin, when inserted is parallel with the rear of the fuselage; use a straight edge to check, **cut the bottom of the fin to achieve this and so that it is the overall length is the correct height for the rudder.**

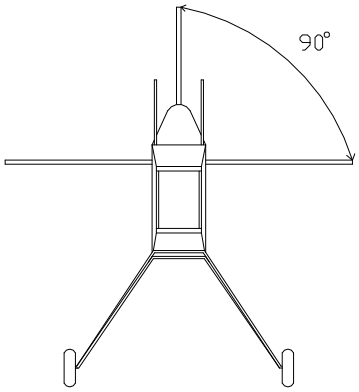




Take the fin and insert into the slot. With a pencil mark along the fuselage as with the tail plane, remove the fin and remove the covering from 1.5mm (1/16") below the line.

!!! **Warning**. Only cut through the film, **do not** cut into the balsa when cutting the fin and tail plane as this will weaken them and may cause it to fail in flight!!!

Re-insert the fin and make sure that the cut-out in the base of the fin lines up with the tail plane slot. Insert the tail plane to confirm. One satisfied with the fit, glue the fin into position, ensure that the fin is vertical.



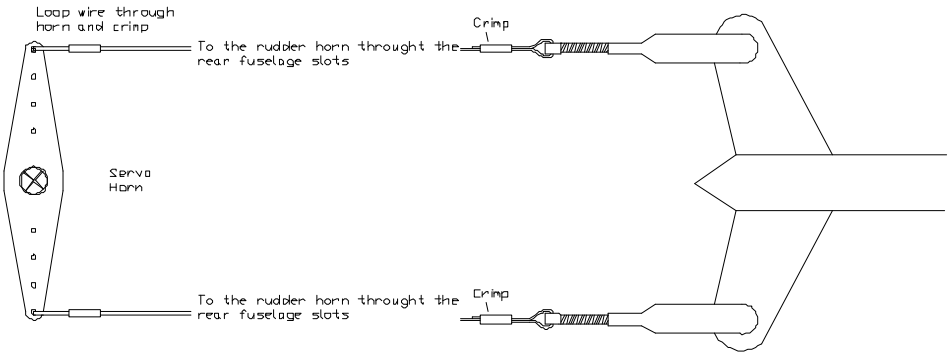
Take the rudder and elevator and glue the hinges, up to 50% of their depth. Glue using a thin Cyano and ensure that it penetrates into the slots both top and bottom.

Insert epoxy into the hole in the elevators made for the wire joiner. Push the joiner through the fuselage into the hole behind the tail plane and insert the elevators on to the joiner while inserting the hinges into their slots. Before the epoxy dries make sure the elevators are level. Making sure you have free movement glue the hinges with Cyano. Pinning the hinges for added security is advised, but this is left to the builders' discretion.

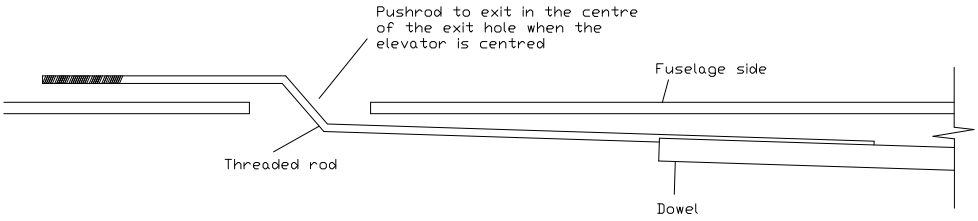
Repeat the hinge gluing process for the rudder.

Mount the servos in the fuselage using your preferred method, positioning of the servos is left to the builder to suit the servos that have been chosen, try to install over the Centre of Gravity position (explained later).

Install the closed loop system to the rudder as shown below using the wire, crimps, closed loop adaptors and metal clevises Ensure the supplied M2 nuts are used on the closed loop adaptors to prevent the clevis from becoming undone. Use 2 of the control horns either side of the rudder with the supplied nuts and bolts to create the horn as shown below.



Make up the elevator pushrod by using the 6mm (1/4") dowel and two of the threaded rods. Measure 50mm (2") from the end, drill a hole through the centre of the dowel, and cut a V groove from the hole to the end. Bend the threaded rod as shown in the picture below before bending the end at 90°, insert into the hole in the dowel and run in the groove. With cotton or fine thread bind the rod to the dowel and seal the binding with Cyano to prevent it unravelling.



Install the control horn to the elevator. Thread the pushrod though the fuselage and place a metal clevis on the rod and attach to the elevator control horn. Thread a metal clevis onto the remaining threaded rod, bend the end to 90° and place on the servo horn. Measure the dowel allowing for the rod to overlap by 50mm (2”), remove from the fuselage and cut to length, drill a hole and bind as before, re-install in the fuselage.

FINAL ASSEMBLY GLOW VERSION

The following paragraphs are for those wishing to use a glow engine, for those wishing to use electric please go on to the Electric Version. Within these sections we can only provide a general overview as we cannot provide solutions for every set-up. Be sure that you read and follow the manufactures recommendations for all the components you are about to install.

Engine Mount

The choice of engine mounting system is left to the builder. For glow versions of the model we have used a rubber mounting system. Ensure the engine is securely fixed to F1 using whatever method you prefer. Be sure to follow the manufacturer’s recommendations when mounting and operating the engine. For further information please feel free to contact us.

Cable and Servo (Glow Version)Throttle

Mount the servo for the throttle so that the throttle arm is closest to the side with the engine throttle body. Make a 4mm (5/32”) hole in F1 and F2 in line with the engine throttle arm. Thread the supplied Bowden outer tube through F1 and cut to length to allow the servo full movement when the inner steel cable and clevis are fitted.

Place one of the supplied clevises on the end of the Bowden cable. Pass it through the outer tube from the engine into the radio bay and clip it onto the engine throttle horn. Fit the second Nipple link onto the end on the Bowden and clip it to the servo horn. Check the throttle operates correctly.

Fuel Tank

Install the fittings as directed by the instructions supplied with the tank. Cut the supplied fuel pipe to provide a feed pipe to the carburettor for filling the tank and pressure pipe from the silencer. We would also recommend fitting a fuel filter in-line. Slot the tank through F2 so that the pipes exit out of F1, pack the tank in with foam to prevent it moving.

FINAL ASSEMBLY ELECTRIC VERSION

Motor Mount

Mount the motor using the recommended motor mount ensuring that it is securely attached to the firewall, do not use screws, only use nuts, bolts and washers suitable for this application.

Electronic Speed Controller (ESC)

On the prototypes we mounted the ESC under the fuselage, if installed in the fuselage ensure that there is sufficient airflow to prevent overheating by either drilling holes in F1 or creating a vent in the bottom plate. Alternatively the esc could be mounted to the underside of the fuselage in the direct airstream.

Motor Battery

We would recommend using a Lithium Polymer (Li-Po) battery for this model, use extreme caution when using and charging Li-Po batteries and **always** read the manufacturers or suppliers instructions when handling and charging this type of battery. The battery sits at the front of the fuselage and can be moved forward or back to alter the Centre of Gravity (Explained later). Once the Centre of Gravity is achieved ensure that the battery is unable to move during flight or foul the servos.

Receiver and Battery Position

The battery and receiver are to be located between the servo tray and tank or flight battery. Ensure that both components are isolated from airframe vibration and that they are not able to move when the model is in flight.

Control Throws

We only recommend setting the model up with sport flying throws unless you are an experienced flyer. Increasing the control rates will make the model extremely responsive!

For test flying and sports flying, set the control throws up as shown below:

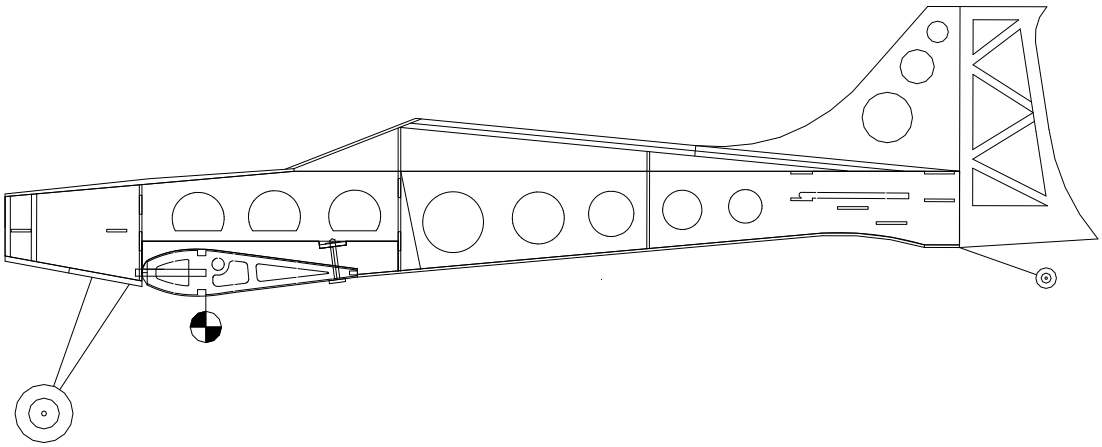
Ailerons – 12mm Up and Down measured at the tip
Elevator – 25mm Up and Down measured at the fuselage
Rudder – 65mm Left and Right measured at the top

Gradually increase the rates form this setting until the model is set up to your flying style.

When you are content with the control setup, use some heat shrink tubing or excess fuel tube over the clevis to ensure that they cannot open.

Centre of Gravity (CoG)

Once you have completed the model, and all components, including receiver and battery have been installed check the balance of the model with the fuel tank empty, or the lipo **installed** in the electric version. The balance point should be on the rear edge of the main spar as shown below. When you and your helper lift the model it should balance on this point, if it does not then add weight to the tail or nose to correct. If at all possible change the position of the Lipo, receiver battery or receiver rather than adding weight.



First Flight and subsequent flights

We only advise flying your model from a BMFA (or your National Model Flying Association governing body) recognised model flying site; we do not recommend flying from a park or public area. If you are an inexperienced flyer we would also recommend getting your model examined by an experienced model pilot before the maiden flight. This model is designed for the experienced modeller in mind. Before each and every flight check the model for damage, check all controls surfaces, hinges and linkages etc are secure, if in doubt **do not fly**. After each flight check the model for any landing damage or flight stresses, never fly a model if you believe that it has been damaged or find any signs of fatigue. Always clean down glow models at the end of each flying session.

Contact

If there are any issues with you kit, please contact us at the address below, please allow 24hrs for us to get back to you. Also contact us for any advice or help during your build, we are only too happy to help.

support@evolution-models.com

Safety & disclaimer

This Radio-Controlled model is not a toy. It can cause serious injury to the operator, public and property if misused or abused. Ensure that you read all the instructions supplied with this kit and instructions provided with the engine and radio control system or any other components purchased separately carefully. Also make sure that any parts bought separately are suitable for their application.

Evolution Models do not have any control over the final assembly of the model or material used for final assembly. No liability shall be assumed for damage resulting from the use of this product. By the act of using the final assembled product the user accepts all resulting liability.

We guarantee the kit will be free from defects both in material and workmanship at the date of purchase; this does not cover any parts damaged by use, misuse or modification. Evolution Models' liability will not exceed the original cost of the purchased kit.

This disclaimer does not limit or reduce Evolution Models' liability for death or personal injury caused by Evolution Models' negligence.