

# MIRAJ

## INTRODUCTION

The Miraj is a high performance slope racing machine, straight out of the imagination of Alexis Marechal, and with the help of Marcel Guwang ( Mg Airfoils ). As for all the Aeromod planes, it excels with the use of full 4 axis flying, especially the centre flap for snap flap type turns. Using surfaces on the wing that are 30% of the overall chord, the airfoil is variable and dynamic. Minor changes to this airfoil section will allow you many applications, from extremely fast in heavy winds to a full floater type plane in light winds. I have flown this plane in winds of 7km/h to 50 km/h. To benefit from this variable foil, no play should be allowed between control horns and servos, we recommend using ball links but the choice is yours. As for the servos, our preference would be for the Hitec Hs 85mg on both the ailerons and elevators, with a strong servo in the centre for the flap (JR 591). I will discuss some 4 axis and crow later.

The ballast tube present in the aircraft is there for a reason, please take care during your construction to make sure your servos and leads are clear of this area so as to be able to insert and remove ballast with ease at the flying field.

The finish is of an acrylic type which does not like solvents such as methylated spirits or acetone. To clean on stubborn areas, use a mixture of VIM and water on a cloth and rub in a circular motion, not too much as Vim has abrasive properties and you may take some of the paint off. For normal stains, soapy water will do just fine.

It should take you about 10 hours to complete this plane so without further a due.....LETS DO IT !

### **Some technical information :**

Wingspan	: 2480 mm
Chords	: 200, 140, 60 mm
Surface	: 42 dm <sup>2</sup>
Profile	: MG 06
Length	: 1250 mm
Unballasted weight	: 1600 g - 1700g
Ballast	: 700 g
Wing Loading	: 38 - 41g/dm <sup>2</sup>
Ballasted loading	: 46, 51, 57g/dm <sup>2</sup>

### **List of Accessories Included in the kit ( South Africa )**

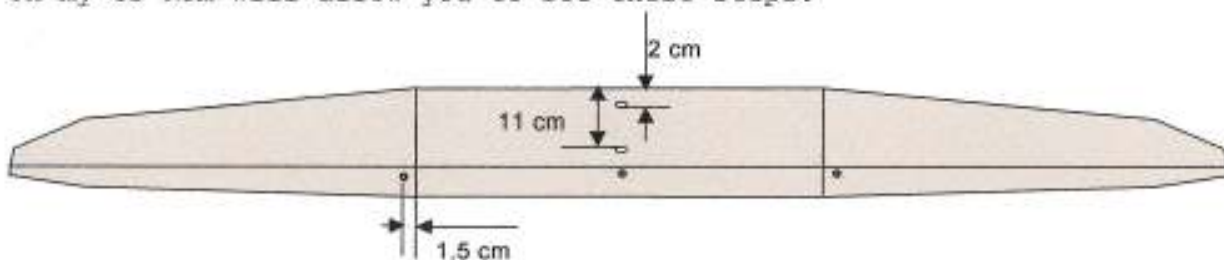
1 Fuselage  
 3 wing panels and 2 ailerons 1 centre panel  
 2 stab panels and 2 elevators  
 Servo mounting wood plate  
 Carbon fibre strands for reinforcing tailpiece.

All the additional items can be supplied with the kit at an extra cost, contact me for any additional items you may need.

### Construction of the Wing.

In order to prevent any glue on the wing during construction, we recommend that you cover it completely with masking tape.

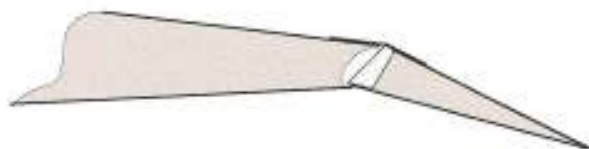
The ailerons are 60 mm (30% of the cord) at the root of the panel and 18 mm at the tip. These have been cut for your convenience. Wing bolt holes are drilled 2cm from the leading edge and 11 cm from the LE for the back bolt. For maximum aerodynamic efficiency, we suggest that you drill a larger hole on top of the wing to countersink the head of you wing bolt. Use a hand drill as an electric drill may go in to quickly, a drill press can be used for maximum control. The control horns for your ailerons should be placed 1.5cm from your aileron as per the picture. As discussed earlier, warp and flutter free ailerons are essential to giving you the best out of this plane, the way to achieve this is to fill the leading edge of the ailerons with a mixture of microballoons and epoxy glue, leave to dry overnight and make sure they dry straight. The photo instructions on my CD Rom will allow you to see these steps.



1 : With a hot iron, dig out the foam from the trailing edge of the wing as well as the leading edge of the aileron



2 : Fill the leading edge of the aileron with a thick mixture of micro balloons and epoxy.



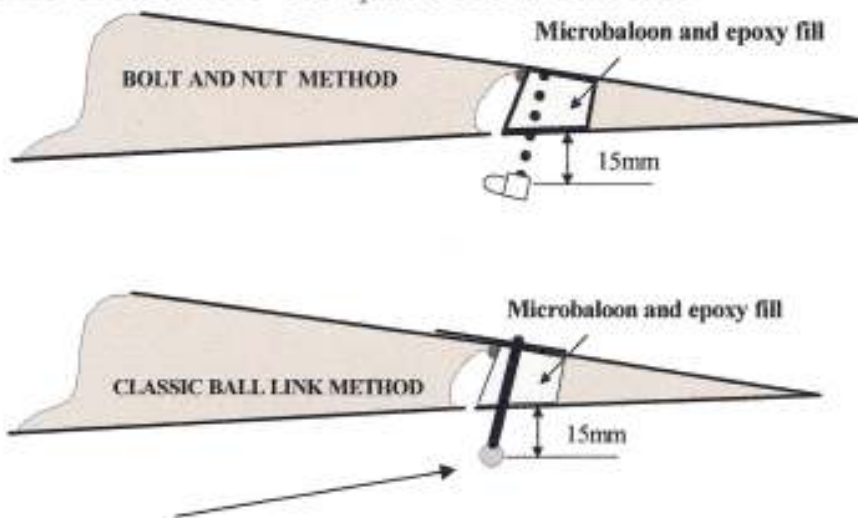
3 : Use masking tape to hold the control surface in position. Make sure the wing TE has enough clearance for downward movement.



4 : Lay a bead of Silicon to the inside of the hinge and set aside to cure.

### Installation of the control horns.

The control horn should be placed about 15mm away from the lower surface of the wing, angled slightly forward in order to line up with the hinge line. Drill a hole in your microballoons epoxy fill and just epoxy the ball link assembly into place. Once again you should have used masking tape on your wing so make sure no excess glue comes out on the top surface of the wing. An alternative method of control horns is to drill a 2mm hole in your microballoons mixture and make a larger hole on top of the wing to allow for a 2mm bolt head to be countersunk, allow the bolt to protrude 15 mm from the wing bottom and place a nut to secure, all you now have to do is screw a control horn aileron clevis on your 2mm bolt, this also allows for quick field removal.



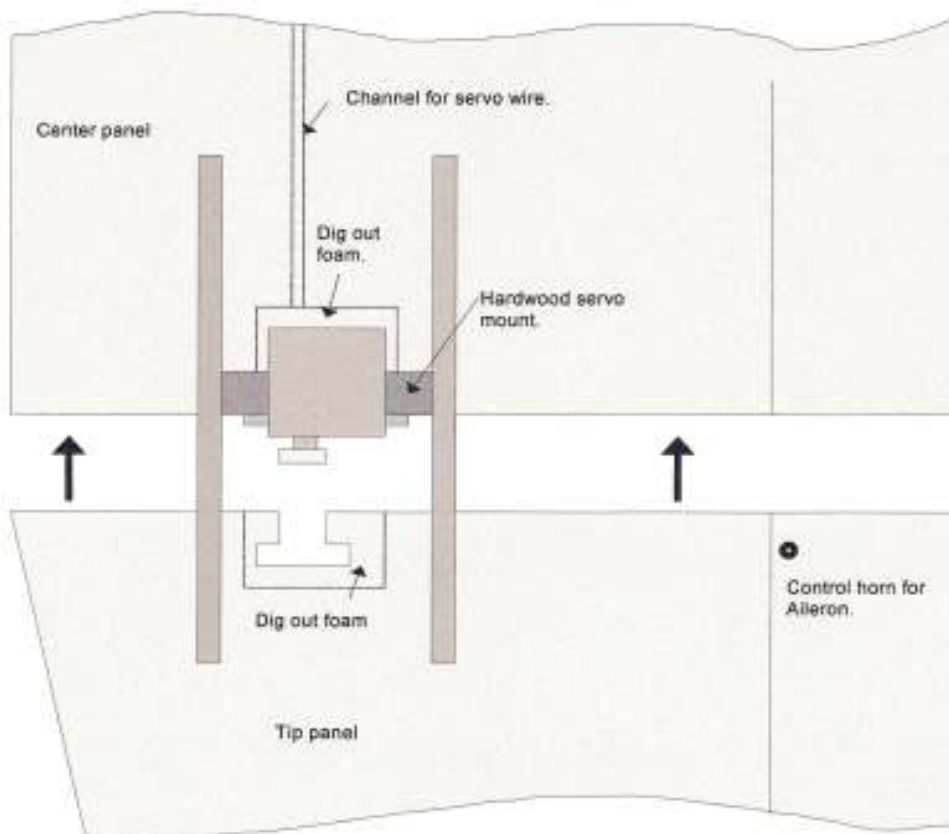
### n bolt and nut

### ron servos

Both aileron servos are installed in the ends of the central panel. Dig out the polystyrene between the 2 blocks of hard wood, which are located between the 2 wing rods. Micro servos with metal gears are recommended. The head and the top of servo exceed in to the tip panel, dig out some foam for clearance. The lower skin on the outer wing panels must then be cut out in a T shape to accommodate the control horn of the servo during wing assembly.. This setup has the advantage of not weakening the wing and of avoiding an additional connectors. During assembly at the flying field, all one has to do is slide the outer panels onto the wing centre panel, attach the ball links and secure the panel with some sort of tape, color matched electrical tape works just fine.

Remember that the servo leads now have to find their way to the fuselage, offset drill a 8- 10mm hole in the fuselage top, do not drill in the centre as this would interfere with the centre flap linkage. We recommend a 9 pin pc plug setup, and instructions for this will be on the CD Rom. This helps with quick dismantling of the wing without wire hassles. Should you wish to run standard leads and plug them into your Rx, then

make sure the leads are of adequate length.



### Wing attachment.

What I like to do in this case is trace the part of the fuselage where the wing will sit. And prepare a block of hardwood to slightly smaller dimensions, take a look from the side and try to sand the same type of shape onto this block. Trial fit it into the fuselage and make adjustments accordingly. Now place your wing on the fuselage and as explained earlier, ensure you have proper alignment and symmetry between wing tip to stab tip. Once you are ready, use a drill press to drill the wing and the fuselage together, I like to keep the wing steady by using a piece of double sided tape. This keeps it well on the fuselage. Match the hole to your piece of hardwood and insert 5mm blind nuts, gluing them in place with epoxy and microballoons. Wax your bolts and place the wing on the fuselage during the drying process, make small alignments if necessary and allow to dry properly ! Once all is dry, remove the wing from the fuselage.

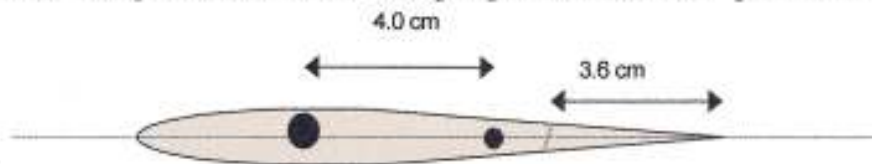
The wing is attached to the fuselage by 2 x 6mm plastic or metal bolts. For slope use we recommend plastic bolts, and for winch we recommend

metal. Remember to respect the distances of the holes in the wing. Remember that indications for drilling are marked on your wing during the molding process, so finding the marks should not present any problems.

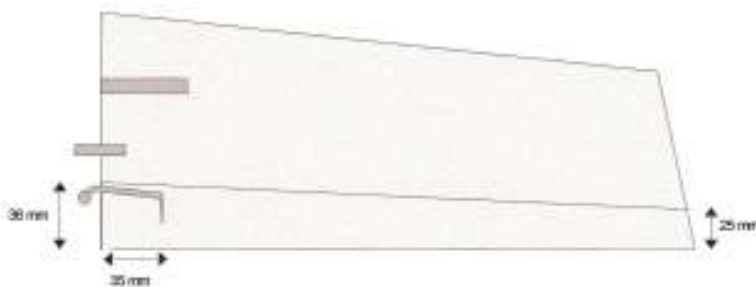
### Installation of the stab.

Reinforcing of the stab section is done exactly as per the wing in the previous steps, rigidity is once again the secret here. With a pencil, draw a line through the middle of the airfoil section and drill a 2mm hole for the alignment pin to fit in. Use thin CA or epoxy to glue this pin in the stab. The pin can protrude about 4mm from the stab. Sliding the stab section on your fuselage, mark the area where you will now drill for the pin to fit on the fuselage. Be careful to drill straight and to make the hole accurate as you must have no play between the pin and the

pinhole in the fus.

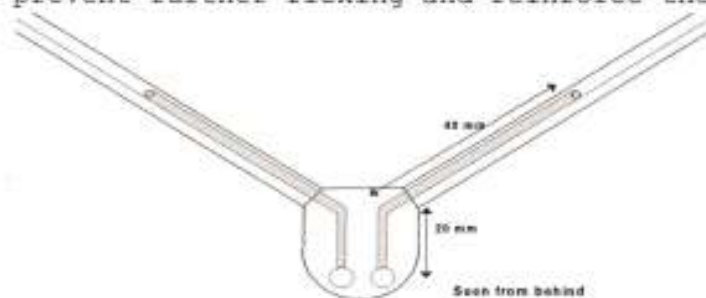


### Installation of the stab links.



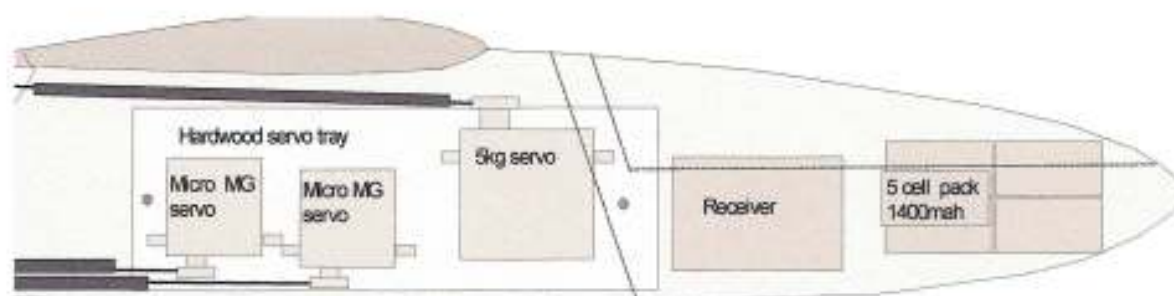
The control horns are made from 2mm piano wire. It is necessary to cut 2 x 70mm lengths and solder a ball link ball to one end, bend them at 20 mm from the ball at an angle of 55° (approximately!). Then bend the other end at a right angle (or better). Drill a hole in your stab that will allow for this control horn to be inserted about 1 cm deep, make sure both your stab links are exactly the same in order to achieve symmetrical throws for elevator and rudder functions. As with the wing, tape the elevator to the stab and silicone hinge, leave to dry overnight. Using masking tape, tape up the 2 carbon stab locators on the fuselage, under no circumstance must any glue come into contact with these rods. With the carbon provided, use epoxy and impregnate the carbon and using a string, double up the carbon and pull it through the stab locators on the fuselage, allow to dry and make sure no glue is left behind. Over and above this step mix a little microballoons and epoxy and put this mixture on the inside of the fuselage where your 2 rods make a V. This will

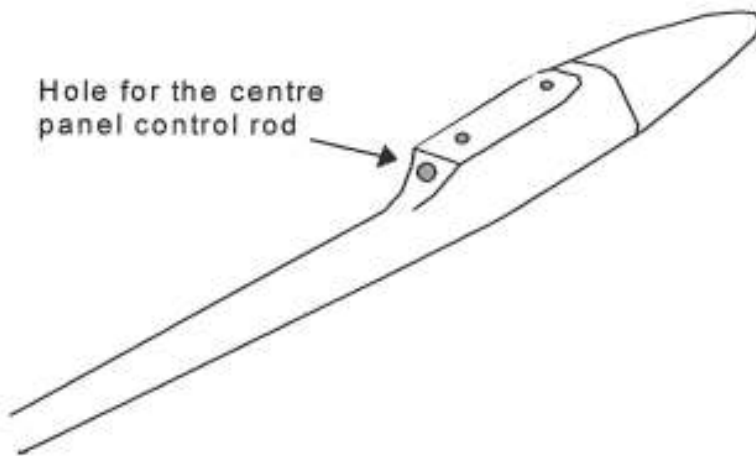
prevent further flexing and reinforce the stab angles.



### Radio Installation

As with all the Aeromod planes, the fuselage houses all the radio components, namely 3 servos and the receiver followed by the battery pack. Your battery pack will be positioned last as it will fine tune your CG settings. Place your 3 servos on the mounting block and if in the case of Hitec servos, use the side mounts provided. As discussed earlier HS 85 Mg servos for the elevators will do just fine and a JR 591 on the centre panel will be more than adequate, once again we cannot emphasize the importance of SLOP FREE CONTROLS ! Pushrods are made from 5mm carbon or glass rods and should be direct to the tail without any bend or friction along the fuselage. Insert some threaded rod on both ends and allow for about 3cm per side for fine adjustments. This will be achieved by screwing or unscrewing the clevises or ball links accordingly. Your centre panel pushrod can be made from 4mm carbon as the distance is reduced. Once all your components are on the tray, slide it into the fuselage and locate the area you will drill. What I do here is place the tray on the outside of the fuselage and position it with the servos and pushrods, move it around until I am happy with the positioning and drill from the outside, remember to place this tray on the other side of the fuselage for drilling ! Use blind nuts inserted in this tray and place additional glass or wood in the fuselage to allow you to countersink the screws, especially if the screw falls under your nosecone. Now neatly drill a pushrod exit hole on the rear of the fuselage for the centre panel rod.

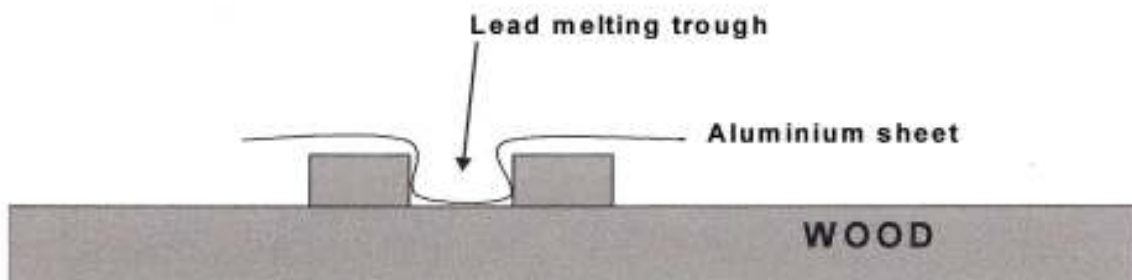


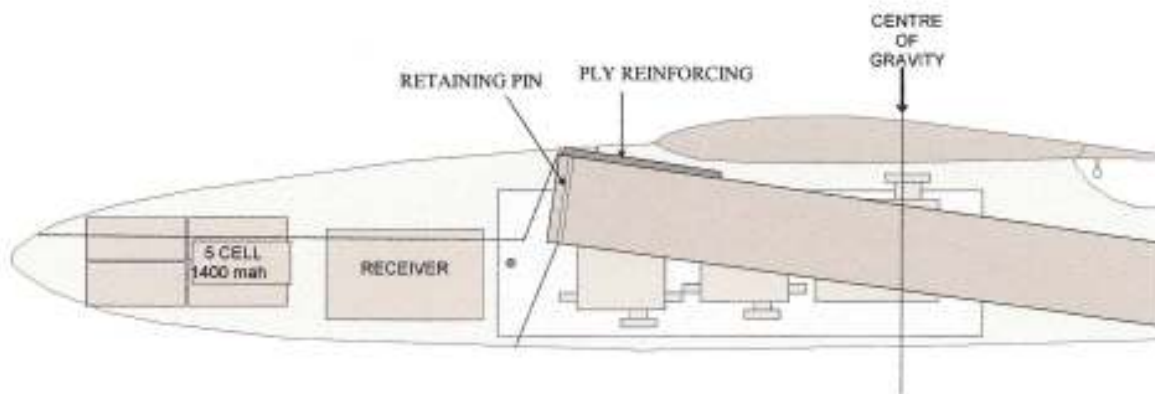


### Ballast

This aircraft can be ballasted with a maximum ballast weight of 700grs, exceeding this weight will cause the plane to suffer in its turn efficiency. Ensure your ballast is secure in the plane and we definitely recommend you try ballast option, the plane remains as stable and maneuverable, with the advantage of extended trajectories and energy retention.

The Miraj has a pre installed ballast compartment which we like to fill with 3 slugs of each 240 grs approximately. The dimensions for these slugs would be 100mm x 20mm x 10mm. Using some hardwood a plug is made to the above dimensions, place some foil on your wood to prevent burning and using the traditional method, pour your hot lead in this trough. Allow sufficient cooling and test fit your slugs, minor adjustments can be made for a perfect fit. Remember that lead is hazardous and you must have previous experience to work with it, make sure you wear safety equipment and take care not to burn. Should you wish, this ballast can be purchased from ourselves. We now need to make 2 wooden slugs that will act as buffers during the different combinations of ballast e.g. : wood-lead-wood or lead-wood-lead or finally lead-lead-lead, this setup will keep your C of G true. Finally, drill a hole in your lead compartment to allow for a carbon pin to secure the slugs, place foam or wood to have no play between the slugs and the carbon retainer pin.





### Control set up

Positive (+) values refer to down movement of the control surfaces and are measured at root of the control surface.

Elevator		-7 / +7mm
Rudder		-11 / +12mm
Ailerons		-22 / +16mm
Camber		-2 / +4mm
Landing Flap		+30mm
Crow		-25mm
Elevator compensation with full flap :		+4mm

### Flying

The first flight will be done without ballast, all the control surfaces exactly in the neutral position, and C of G at 85mm from the leading edge.

### CG

The C of G sits about 90mm from the leading edge but with a little flying experience, move it a further 5mm and see what happens ! A little elevator compensation will be required but this is standard. Once you are comfortable with this, ADD your BALLAST and EXPERIENCE IT!

### Camber.

Add a bit of positive camber for light slope lift. You will be surprised. 4 axis flying is the way to g. If your radio is used exclusively for the slope, we suggest you do away with the ratchet and put in a spring. This is discussed under 4 axis flying. At present we fly this range of aircraft at Northcliff and demo flights are available on the following Aeromod planes :

Nuaj  
Mini j

Prodi j  
Prodi j 2  
Voltij  
Miraj  
Arkanj

I hope you find many hours of enjoyment with these planes, I can be reached on the following number 083 463 8472 and on [arnaud@icon.co.za](mailto:arnaud@icon.co.za).

Happy flying  
Eric Arnaud.