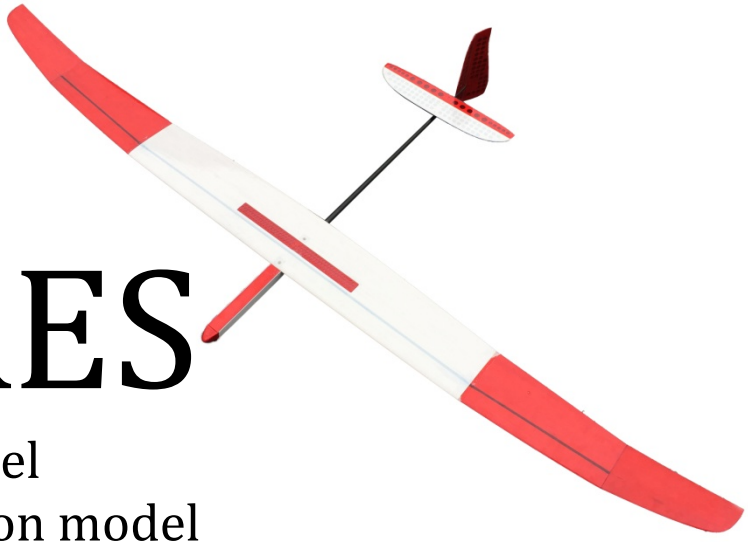

MADRES

Fun-RES model
F3B-R.E.S Competition model

Version	Description	Date
0.1	Initial Draft	2016
0.8	First Update	Dec. 2016
0.9	some tech. terms updated	Dec. 2016

1. Introduction

Dear Customer

Thank you for purchasing the MADRES from "FraundorferS"
The MADRES is a 2 meter RES-Class glider perfect for chasing even the smallest thermals.

Technical data:

Weight (ready to fly):	ca. 310 – 350 g
Wingspan:	1992 mm
Length:	1067 mm

On the following pages describe the building of the MADRES step by step as I recommend it. If you need further guidance, don't hesitate to contact us personally.

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Additional information about us, our range of models and ongoing projects you can find on www.fraundorfers.at

2. List of Parts

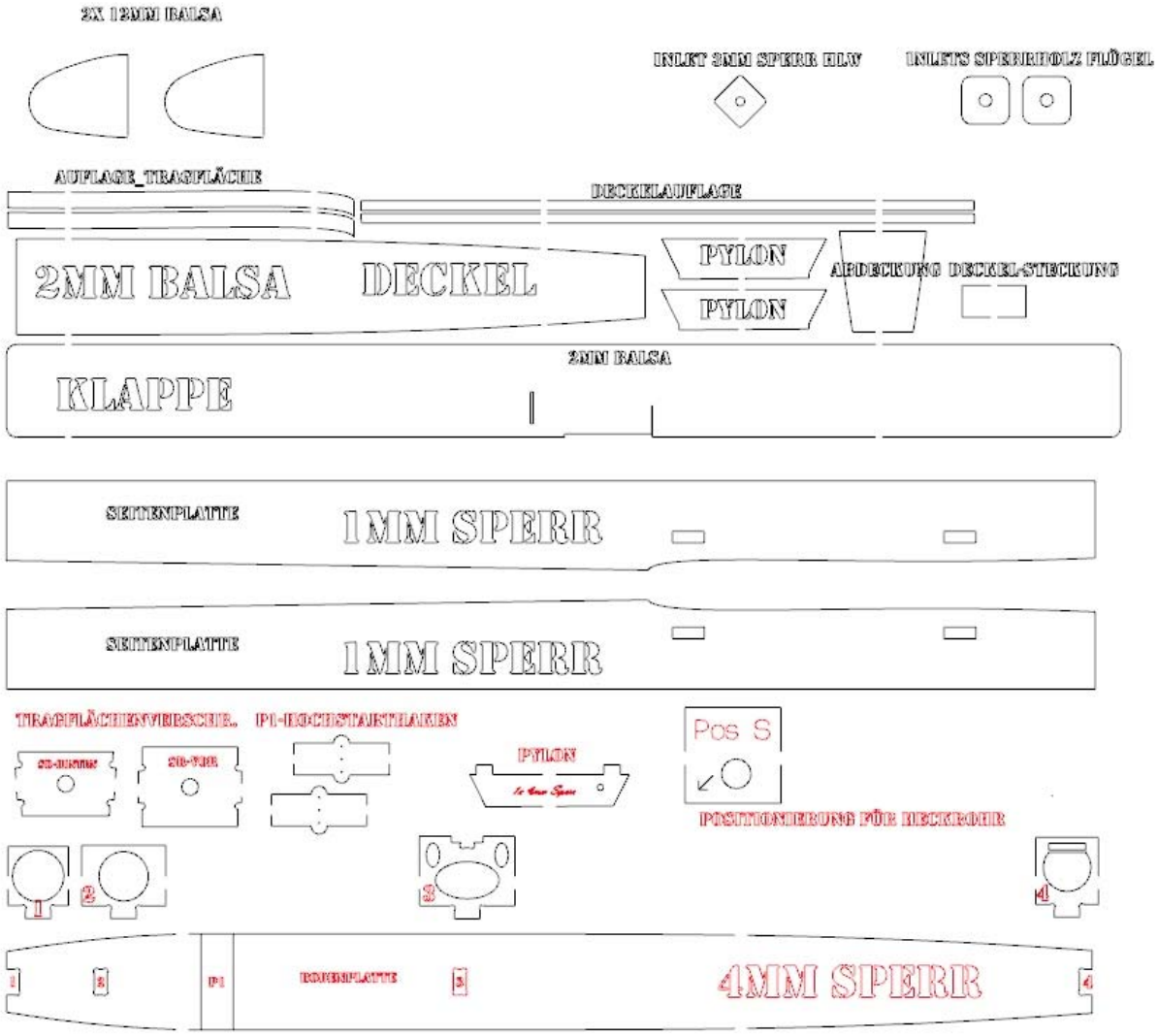
Main Parts

1. Balsa-wood wing (5 parts)
2. Fuselage (balsa-wood, ply-wood parts)
3. Rudder and Elevator (3mm balsa-wood)
4. Carbon tube (Tail-Boom)
5. Carbon fiber strips (1000 x 5.8 x 0.6mm (3) / 200 x 2.9 x 0.4mm)

Small Parts

6. Glass fiber control horns (1mm)
7. Tow-hook
8. 2 x M4 countersunk screw (polyamide)
9. 2 x captive nut M4
10. 2 x snake tube (ca. 5 cm)
11. Magnet (canopy lock)
12. 1 x washer M4
13. 3 x plywood inlets (1 x elevator; 2 x wing)
14. 2 x joiner (2mm glass fiber) + 2 joiner bags
15. 1 x positioning device for the tail boom (plywood)
16. 20 cm steel wire 0.5mm (springs)
17. 3 part pylon (elevator mount 1 x 4mm plywood, 2 x 2mm plywood)
18. 2.5 mm lfm steel wire (linkage)
19. 1 x screw 2.9 x 13 mm

3. Wooden parts



4. The assembly

Preparation

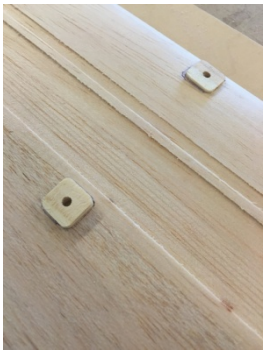
First put all the parts on your workbench and check them for completeness. If anything is missing, please contact us.
We suggest to group the parts along the building blocks (wing/fuselage/rudder & elevator)

Wings

The 5 main wing parts are CNC milled and we therefore recommend to give them a light sanding with a 240 grit sandpaper. The dihedral at the joints is already set and mustn't be altered.

First cut the 3 carbon strips (5.8 x 0.6) to the correct length (2 for the main wing panel and 2 for each inner tip). The strips must fit exactly into slots of the 3 wing panels and **should not overlap them**!

Now completely open up the milled openings in the main wing panel for the screw connection inlets, which is best done with a sharp carpet knife. Sand one side of the prepared carbon strips (120 grit sandpaper).



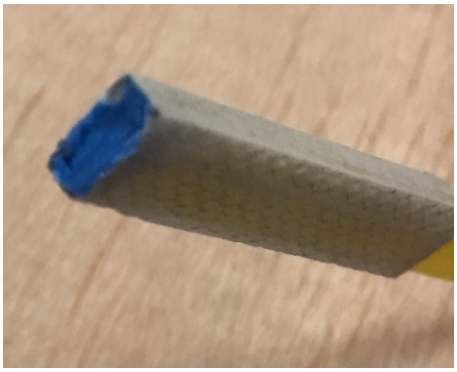
Try to fit the 2 plywood wing-inlets into the milled recesses in the main wing panel. If they don't fit in easily sand the edges until you get a perfect fit. Now glue them into the recesses with the glue of your choice (epoxy/wood glue). It's important that the glued in inlets flush with the wing surface!

Put the joiners (2 mm glass fiber) into the joiner bags (they will be later on glued into the wing panels between the wing reinforcement carbon strips) and cut out a recess in the center of the milled channel of the main wing panel (joiner bag) and the tip (**only for the joiner!**). Make

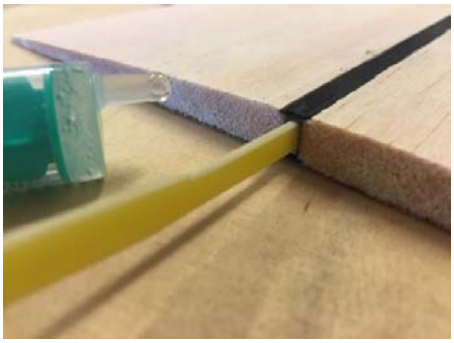
sure that the joiner bags and the joiner fit into the recess easily but without movement.

Next clue the prepared carbon strips in the milled channels of the main wing panel. For this you best use epoxy or a low viscosity super-glue.

Before you glue (Epoxy) the joiner bags and the joiner into the main wing panel you have to sand (120 grit sandpaper) both parts slightly to assure a proper bond. In addition close the joiner bag on the end which is glued into the main wing panel with some modelling clay (Play-Doh 'borrowed' from your kid works as well) or wax to avoid epoxy running into it.



Now glue (epoxy!) the joiner bags into the main wing panel. Make sure that the joiner bag has good contact with the balsa (left- and right-side) as well as the carbon strips (top and bottom).
Now clue the carbon strips (as you have done with the main wing panel) in both inner tips.



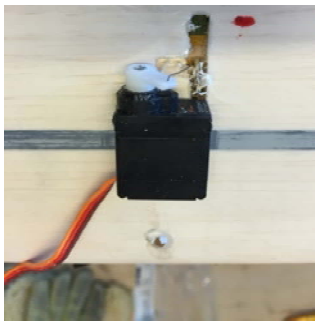
For the next steps we don't recommend to do both sides in parallel.

Give the joiners on the side which will be glued into the tip a light sanding to (120 grit sanding paper) to get a proper bond when gluing them into the tip. Slide the joiner into the joiner bag of the main wing panel). Now put some Epoxy into the cut out slot of the tip and slide the tip onto the joiner. There shouldn't be a gap now between the main wing panel and the tip (**Do a 'dry fit' in advance**) . To assure the proper dihedral lay a 44mm balsa block under the end of the tip and let the Epoxy cure. Repeat the steps for the other side.

The joiner is the only connection between the main wing panel and the tips. The two panels will be secured with crystal tape for flying. Although not needed an additional hesitation pin can of course be installed by yourself.

Remove the tips from the main wing panel. Now you can glue the outer tips on the inner tips. This is also best done with Epoxy. To assure the correct dihedral put a 85mm balsa block under the end of the outer wing panel while curing.

For the spoiler linkage, glue (or tape) the servo to the bottom side of the wing. For the linkage itself use a 0.5 mm steel wire.

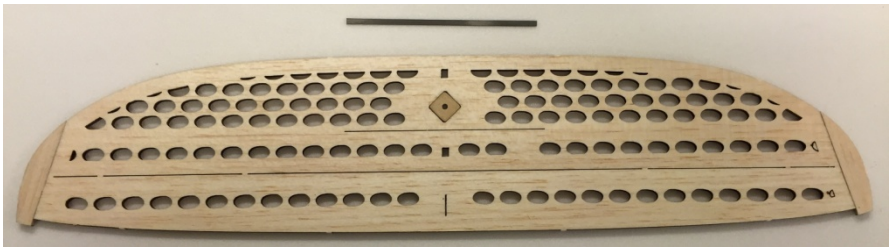


Lightly sand all wing surfaces (especially the glued joints and the carbon reinforced areas) to get a smooth surface. Now the wing is ready to get covered with the foil of your choice.

Rudder and Elevator

First remove all balsa parts from the 3mm balsa sheet, then align the vertical tail fin and the vertical tail rudder and tape them together with masking tape. Give both ends a light sanding before gluing the top and bottom tip to the vertical fin. Do the same with the Elevator. All tips (Rudder and Elevator) are slightly longer than needed. Glue them flush with the leading edges of the rudder and elevator. After the glue dried you can sand the overlaying parts of the tips flush with the trailing edges of the rudder and elevator.

Now cut a piece in the length of the milled slot in the elevator from the 200 x 2.9 x 4 mm carbon strip and press it into the slot (vertically) and glue it in with thin super glue. Next dry fit the 3mm plywood inlet for the elevator mounting screw (the edges may need some light sanding). When you have tight flush fit you can glue the inlet into the elevator.



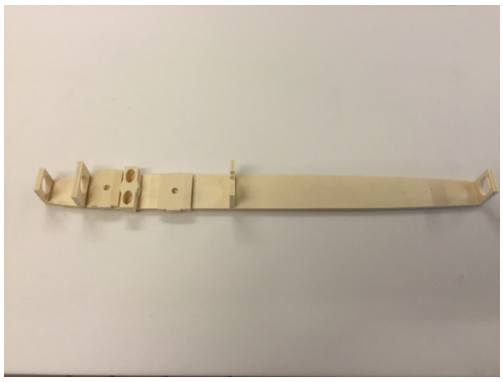
Carefully sand the elevator from the hinge line to the trailing edge to get a 'sharp' (1.5mm) trailing edge. To have the elevator mounting screw (2.9 x 18 mm) as flush as possible with the elevator bevel the inlet a tiny bit.

As a last step cut the elevator along the hinge line in two (do not cut through the tips!) and sand an angle into the moving bit allowing a down elevator movement of 10mm.

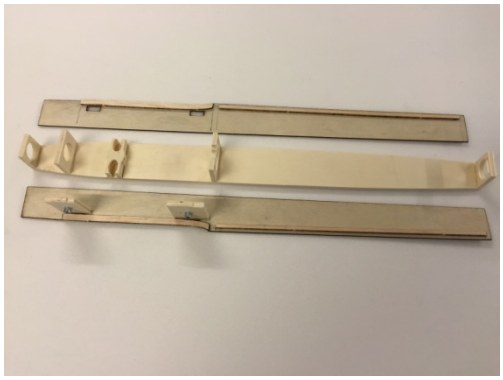
Fuselage

Prepare all parts of the fuselage.

First put the bottom 4mm plywood part (milled slots facing up) on your (flat) building board. Glue in the spars onto the fuselage bottom (the numbers and positions can be taken from the drawing of the wooden parts in chapter 3). Make sure that the spars are at right angles and flush on both sides with the bottom part. Lightly sand the joint of the spars and the bottom on both sides.

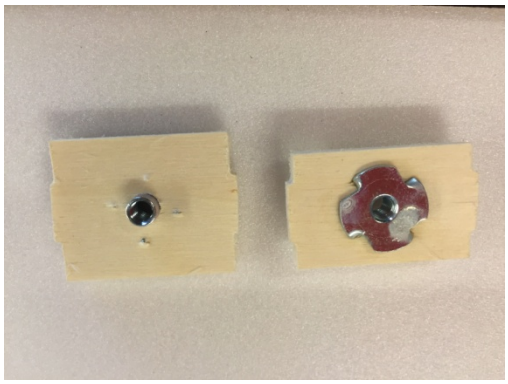


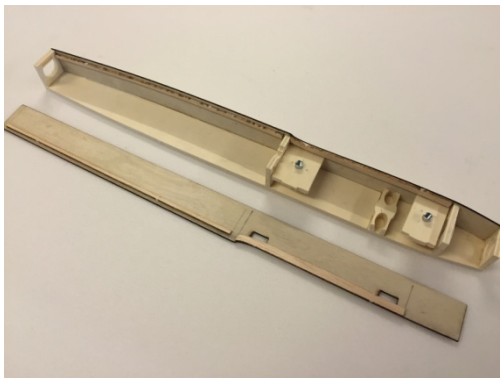
Next you need the two sides of the fuselage as well as two 2 x 2mm balsa strips and the 2mm balsa parts with the cut out section of the wing underside. Mark the positions of the spars with a pencil on the side parts (make a left and a right one!). Glue the 2 x 2mm balsa strips with an offset of 2 mm from the top edge onto the front part of the fuselage sides (the balsa strips will support the cover plate at a later stage). The 2mm balsa parts for the wing support must be glued flush with the top edge of the side panels (again, make sure that you have a left and right side!).



Now you can glue one side to the bottom/spar construction.

Put a drive-in nut from below into the parts SH-VO (VO = vorne = front) and SH-HI (HI = hinten = back) and secure them with epoxy or super glue. SH-VO and SH-HI can now be glued onto the side panel and spar (must be parallel to the fuselage bottom).

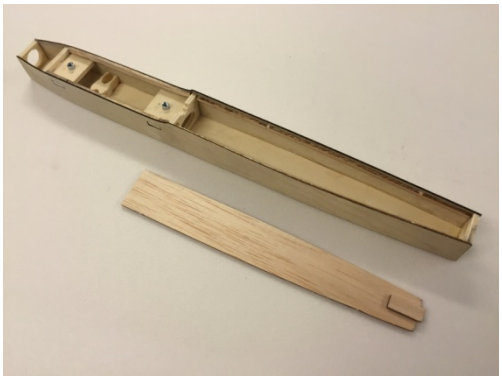




Glue now the 2nd side panel to the fuselage. The next step is to sand the edges, glue joints and the font- and back-most spar.

For the nose you first must glue the 12mm balsa parts together before you can glue the whole balsa block on the fuselage. Sand until you have a nice shape. Dry fit the 2mm balsa cover plate and – if needed – slightly trim it to get a nice fit.

The cover plate is secured with a 2mm balsa piece in front and a magnet on the back. Glue the magnet in the cut of spar no. 3 and the M4 washer centered on the underside of the cover plate. Make sure that the washer is flush with the end of the cover plate.

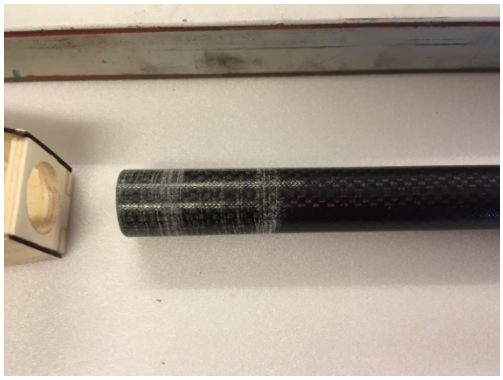


Draw a center line with a pencil on the underside of the cover plate. Take the small 2mm balsa piece and round the edges and corner on the nose facing side.

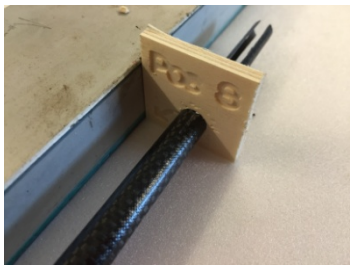
Now glue the piece onto the cover plate. To do center the 2mm balsa piece on the center line with an overlap of +/- 4mm on the front of the cover plate. Put a small once folded paper in the front part between the cover plate and the balsa piece to get a slight angle.

Tail-Boom

You need a long ruler or square profile (ca. 1m) to correctly mount the tail-boom!



Put the fuselage alongside the ruler and slide the tail-boom through the openings in spar 1 and 2. Mark the positions of the spars on the boom with a pencil and take the boom out again. Sand the marked areas on the boom to get a proper glue joint later. Put the boom back in the fuselage and slide the 4mm plywood mounting gauge from the back onto the boom (the arrow on the gauge must point towards the bottom edge of the square profile/ruler).



Now you can put the rudder into the slot of the tail boom. Make sure that the rudder is exact square to the table. Now the boom is perfectly aligned and can be glued to the fuselage. You best use Epoxy to do this.

The next building step is the mount of the support pylon for the elevator. Take the 3 needed piecses (1 x 4mm plywood; 2 x 2mm balsa). There is an arrow on the plywood part which must point to the nose of your plane. Mark the nose pointing end with a pencil on top to know the nose facing end after gluing on the 2mm balsa parts (important for the correct angle of incidence). Now you can glue the balsa parts onto the plywood (Super Glue) and round the front- and backside with sanding paper.

While doing this take care to not sand the two wooden pins on top as they are needed to center the elevator.

No wrap some sanding paper around the boom (ca. 6 to 8 cm in front of the rudder slot) no gently sand the pylon bottom to the shape of the boom.

Now we suggest to cover the pylon and the elevator with the fabric of your choice.

Put the elevator on the pylon and fix it with the 2.9 x 13mm screw. Also mount the wing onto the fuselage. Align the elevator with the wing center panel and glue the pylon on the boom (Epoxy). The distance between the rudder and the trailing edge of the elevator should be approximately 10mm.

Slide the rudder into the slot and make sure that the two marks on the rudder align with the boom. Additionally make sure that the rudder hinge line is exactly vertical. When achieved you can glue (Super Glue or Epoxy) the rudder to the tail boom (if everything was done properly before you should have an exact angle of 90 degrees between elevator and rudder). The rudder can now be covered.

As a last step you need to bend two ca. 5cm long springs out of the 0.5mm wire. The torsion angle should be +/- 100 degrees.

Mount the springs to the rudder and elevator.

RC installation

The RC installation can now be done as you like best.

We recommend the following components:

Servos:	3x Dymond D47 (Robbe FS31)
Receiver:	as small as possible
Battery:	LiPo 300mAh 2S

Settings

CoG:	73 – 78mm behind the leading edge
Deflections Elevator:	+ 8 / - 4 mm
Deflections Rudder:	as much as possible
Brake:	0 – 60 Degrees
Tow hook position:	Approximately CoG