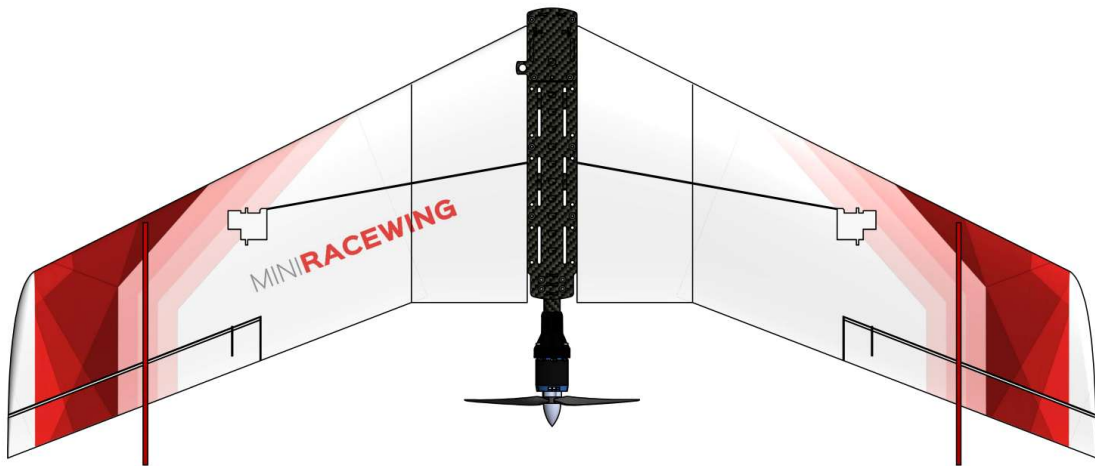


# MiniRaceWing

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## User Manual



**Please read this manual carefully  
and follow the instructions**

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Thank you for purchasing the MiniRaceWing.  
We recommend this plane to intermediate and experienced pilots.  
Fly safe, have fun!

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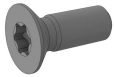
## 1 Safety Instructions

- Choose your flying location wisely. Check for hazards and avoid endangering you, others, animals or property.
- Don't fly in storms, strong winds, and generally bad weather.
- Never fly near people, houses, traffic, airports or powerlines.
- Check the regulations on RC model flying in your country.
- Do a pre-flight check. Do it every(!) time you take off. Check if the wings are firmly attached and fully inserted. Check the control surfaces, motor and propeller.
- Not recommended for children under twelve. Children should be accompanied by a responsible adult.

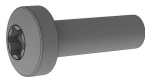
## 2 Part List

### Quantity Part

4x M3 x 8mm countersunk head



21x M3 x 10mm raised head



4x M3 x 16mm raised head



4x M3 x 25mm raised head



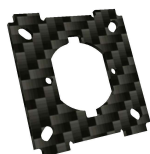
1x Camera cover



2x Camera mount 1

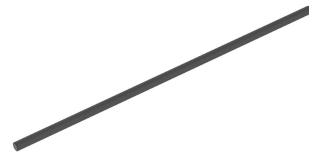


1x Camera mount 2



### Quantity Part

2x Carbon rod 210 x Ø5mm



2x Carbon rod 400 x 6 x 1mm



1x Carbon tube with motor mount



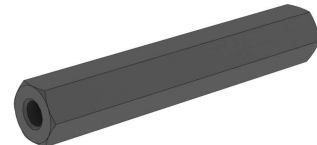
1x Motor plate



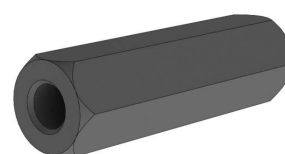
4x Wing mount C



4x Spacer bolts 35mm



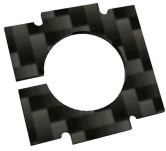
5x Spacer bolts 20mm



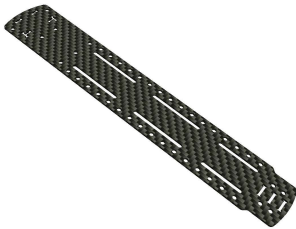
2x Carbon rod 90 x Ø5mm



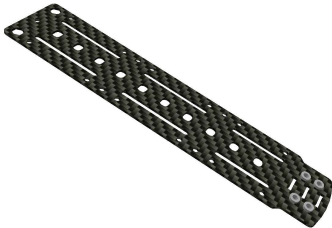
3x Tube clip



1x Bottom plate



1x Top plate (containing 4 press nuts)



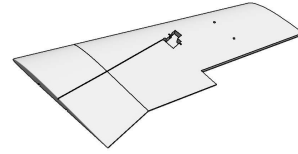
1x Camera plate



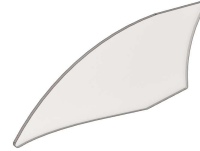
2x Wing Mount A 1,5mm  
(containing 2 press nuts)



2x Wings (left & right)



2x Winglets



4x Plastic screws M4x25mm



2x Sets of servo linkages



2x Servo extension cable



2x Balsa elevons



2x Wing mount B 2,5mm



1x Decals



2x Velcro straps



### 3 Specs

Wing span:	940mm
Length:	~300mm
Take off weight:	500-800g
Fuselage Material	High quality carbon fiber
Wing load:	40 – 60 g/dm <sup>2</sup>
Center of gravity	130-135mm (measured from the wings leading edge)

## 4 What you need

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Cutter



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Wide transparent scotch tape



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Superglue



## 5 Wing Assembly

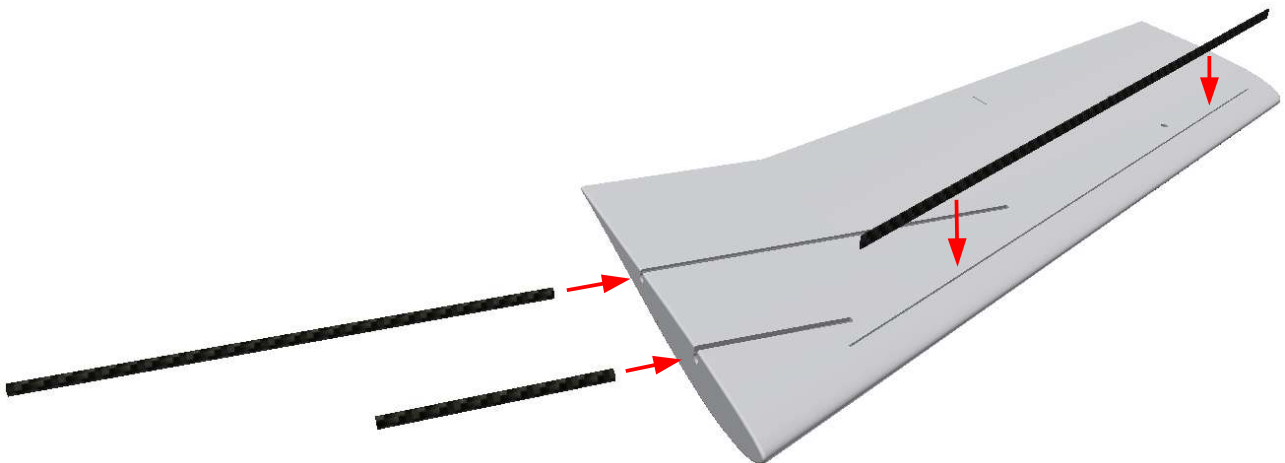
### 5.1 Carbon rods

- Left wing & right wing
- 2x 90x5mm carbon rods
- 2x 210x5mm carbon rods
- 2x 400x6x1mm carbon rods

Put the rods in the corresponding slots. Make sure that the round carbon rods stick out of the foam exactly 21mm. Glue the carbon rods in place using superglue.

Do this for both wing halves.

The Superglue dries a bit slower inside the slots. Therefore, let the wings sit for a bit and prepare the rudders/elevons in the meantime.





## 5.2 Balsa elevons

- 2x balsa elevons
- Template of the rudder horn position

First we need to add the slot for the rudder horn. Print out the template at the end of this manual called "Rudder cutout template". Use 100% scaling so it has the original dimensions.

Use the template to mark and cut the ruder horn notch into the rudder. Make sure the rudder orientation is correct. The elevons will be hinged to the bottom side of the wings. Make sure the elevon are aligned like shown in the picture below.

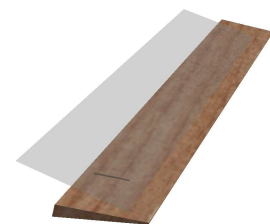


You can use a cutter or a 1mm drill. Drill a few holes, then cut or file the remaining material away. The rudder horns will be added later.

If you like you can smoothen the outer edge of the elevon with sandpaper to match the tip of the wing. Use tape or covering film to completely seal the elevon to protect it from water and strengthen it.

To attach the elevons to the wings, we recommend the following procedure:

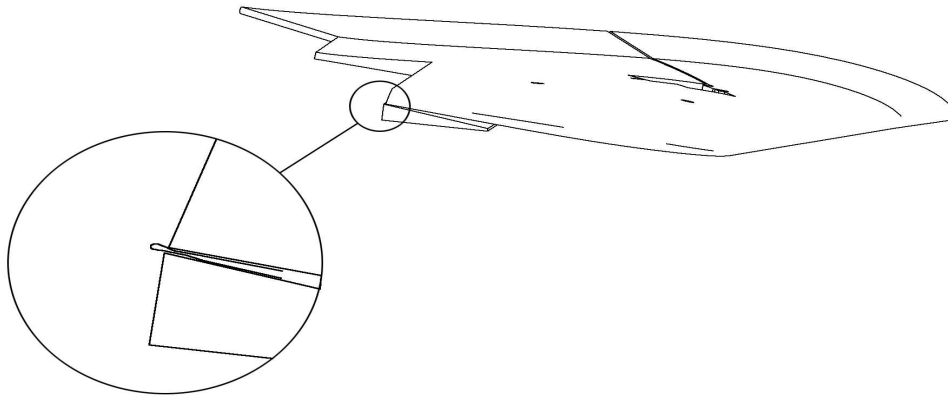
Use high grade wide (~5cm) scotch tape. Cut a piece as long as the elevon. Put the tape on the bottom side (elevon is upside down in the picture) of the elevon so that half of the tape overlaps.



Put the wing bottom up and bring the elevon to the wing. Hold the elevon in full top deflection. Now press the overlapping tape gently to the wing. Start in the middle and work your way to both ends. After the tape is in place press it firmly onto the wing.

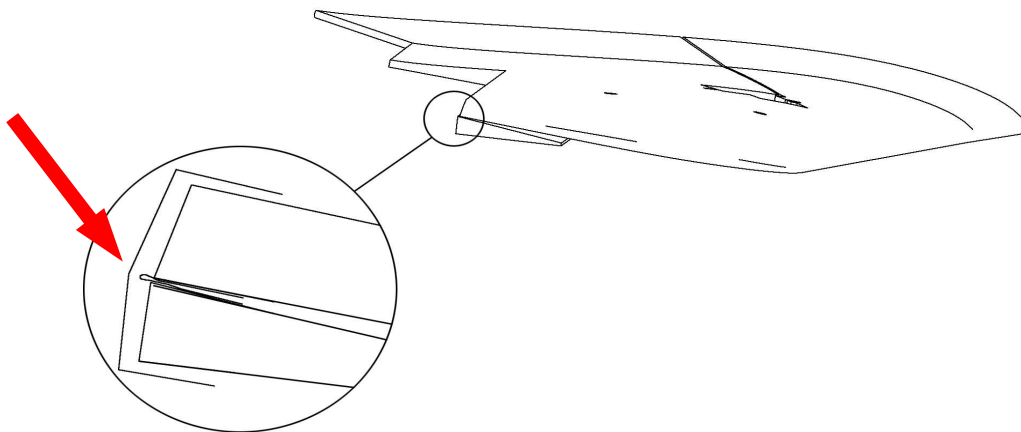


Fold the elevon to the other side so that it lays on the bottom side. You should see a bit of bent tape between the wing and the elevon. Make sure the edge of the rudder is aligned to the edge of the wing.



Use another strip of tape and cover the hinge and secure it in place. Take care that both tapes are touching to make a strong hinge.

**For the hinge to have its full strength the tapes have to touch each other!**



Fold the elevon back and check if it can be easily moved and has little play.

If it doesn't work the first time, don't be afraid to start again. When the bent tape does not stick out if you fold the rudder back, you should leave a small gap between the rudder and the wing when you attach the rudder with the first tape.

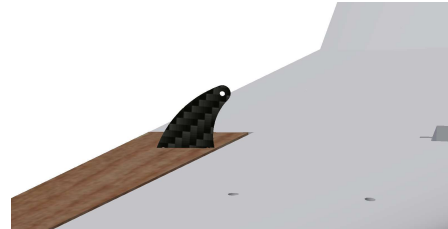
## 5.3 Rudder horns

- 2x Rudder horns

Now you are ready to add the rudder horn.

Put the rudder horn into the cutout and see if it fits.

If it fits, apply super glue all around the notch at the top and bottom.



## 5.4 Servo and Linkage

- 2x Servo Linkages
- 2x metal rods with a threaded end

Take the metal rod. Measure 75mm from the side with the thread, including the thread. Cut the rod.

Screw the thread all the way into one of the ball linkage. Pliers help to hold the metal rod.

Push the other side of the rod all the way into the second ball linkage.

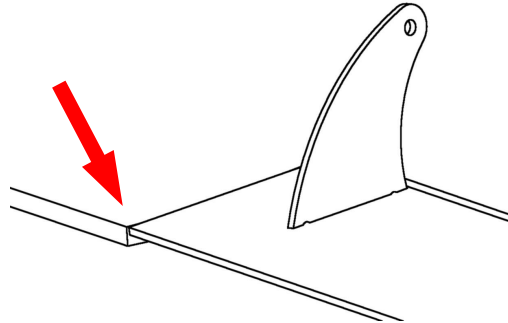
Take the servo arm (remove it from the servo if it is attached) and attach it to one of the ball linkages. Use the third hole or 9mm from the servo arm axis. You might need to widen the hole for the screw to fit.

Take the second ball linkage and attach it to the rudder horn. Attach the servo arm to the servo. Make sure the servo is in center position and the servo arm points straight up. Secure the servo arm with a screw.

Put the servo in place (Don't glue it in yet!).

Check the rudder position. The top of the rudder should be flush with the wing.

If not, screw the rod in or out of the ball linkage until it fits. Make sure the non-threaded end is fully inserted during measuring.



If everything sits right, glue the non-threaded end in with superglue.

Check the full range of the servo movement. Depending on your servo you might need to cut a bit of the foam to allow the arm to move its full range.

Before permanently gluing the servo into the wing, make sure the servo cable is long enough. There should be about 1-3cm of cable sticking out of the wing. If the cable is too short, extend the cable. You can either cut the wire and solder an extension to it or use a ready-made extension cable.

**Don't use the servo extension cables from the kit.**

They will be used later and are needed to enable the wings to detach during crashes.

There are several ways to attach the servo.

- You can tape the servo and superglue it in position. Make sure no superglue gets into moving parts!
- Or you could use hot glue. Apply the hot glue to the servo, not to the foam. Then push the servo in position.

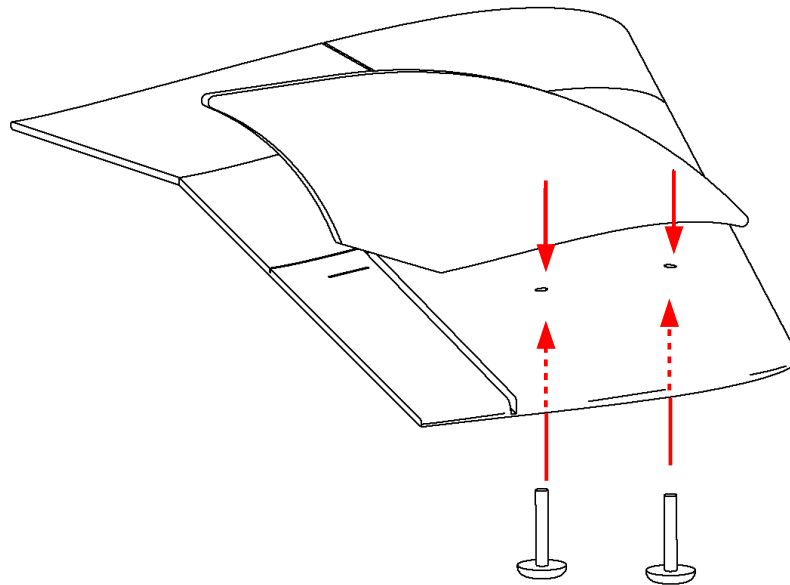
Depending on the size of your servo cable you might need to move a screwdriver through the slot once before pushing the servo cable in. Press the servo cable into the slot and cover servo cable and servo with tape.

## 5.5 Winglets

- 2x Plastic screws M4x25mm
- 2x Winglets

Puncture the holes for the winglet screws with a small screwdriver and put the plastic screws in from the bottom side.

Bring the winglet into position and put the screws into the pre-drilled holes in the winglet. You only need to tighten them the first 10mm, after that just lay the wing flat on a surface and carefully press the winglet onto both screws. Take care to not snap the screws or the winglet.



To detach the winglet, hold the winglet and unscrew the screws a bit. You can pull the screw out after a few mm of unscrewing.

The screws are tight for the first 1-5 moves. After that you can also lay the wing flat on a surface and place one hand flat right beside the winglet. Push the wing down on the surface while simultaneously pull the winglet upwards with the other hand.

## 5.6 Taping and Finish

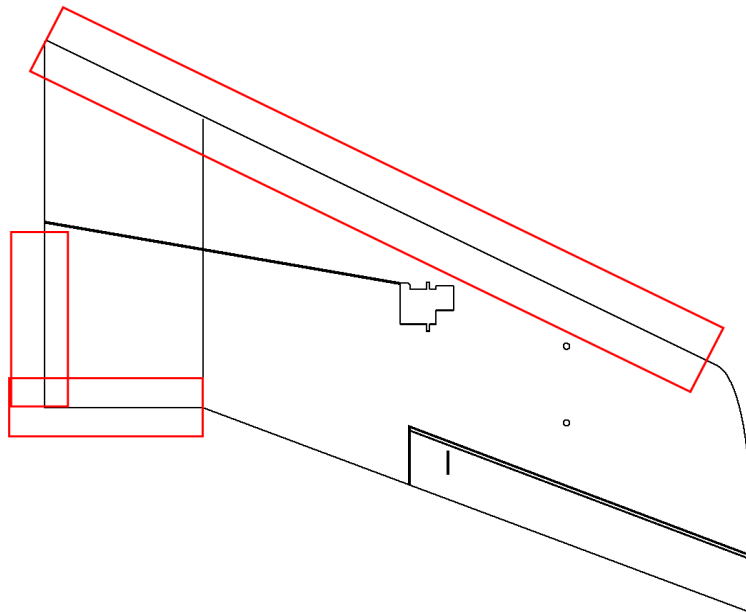
- Decals
- Tape

### **Attention**

*We don't recommend laminating the wing. The wing is stiff and works well even above 160km/h. If you want to laminate the wing, take extra care to not twist or bend the wing as this will completely destroy the properties of the wing.*

Use tape to cover the leading edge and the root of the wing as shown in the image. Apply the tape to the top and fold it around to the bottom.

This will strengthen the wing against damage during crashes. If you like, you can also cover the slots for the carbon rods on the bottom side.



You can apply your own decals or you can use the ones provided with the kit. Another option is to use colored tape or paint. If you want to paint the wing use acetone to clean the wing before painting.

## 6 Fuselage Assembly

### **Attention**

*Be careful while tightening screws into plastic or you will damage the threads. There is usually a distinct change in resistance when you reach the end. Don't screw further.*

### 6.1 Fuselage preparations

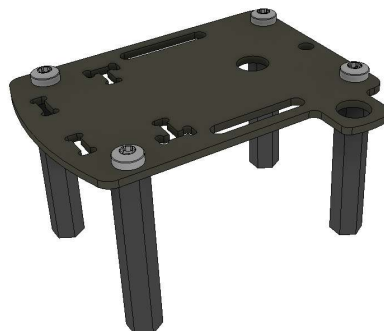
- Top Plate
- 5x M3x10mm screws
- 5x Spacer bolt 20mm

Screw the spacer bolts to the top plate. The spacer bolts go to the opposite side of the press nuts that are already in the plate.



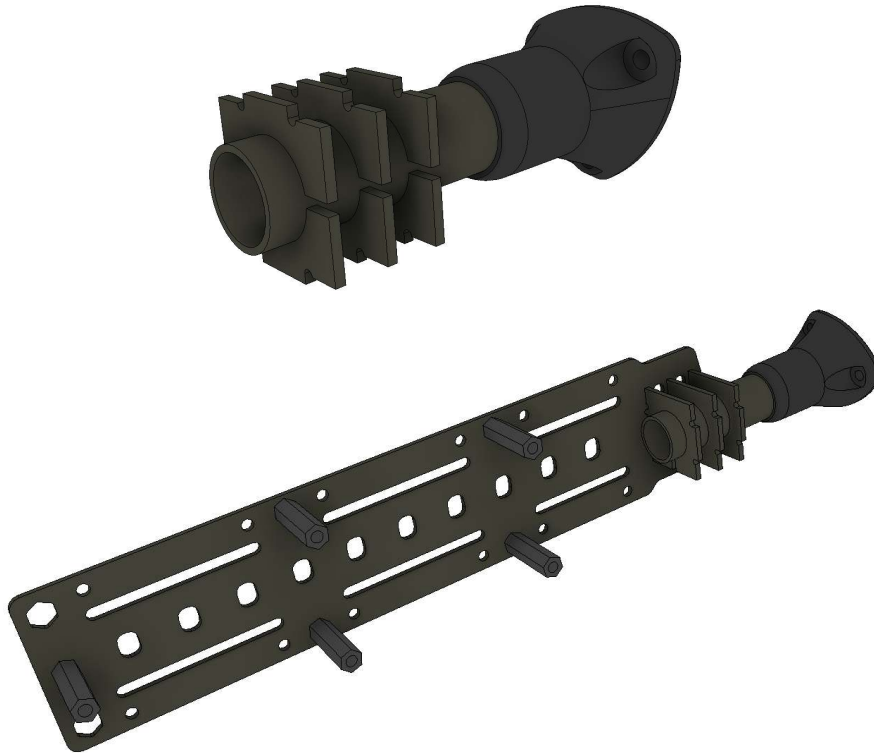
- Camera Plate
- 4x M3x10mm screws
- 4x Spacer bolt 35mm

Screw the spacer bolts to the 4 corner holes of the camera plate. If you want to use the antenna mount, consider on which side you want it to be and flip the camera plate accordingly.



- 3x Tube clips
- 1x Carbon tube with Motor mount

Put the three tube clips on the carbon tube. **Make sure that all three slots are aligned.** Put the clips with the tube into the slots at the Top Plate. Secure the clips and tube temporarily with a zip tie or tape.



Attach the camera plate to the top plate by pushing the two spacer bolts through the holes in the top plate. They sit tight and you might need a bit of force to push them in.





## 6.2 Component installation / Servo extension cables

- 2x Servo extension cables

Test where you want to install the electronic components. Leave some space in front of the tube to adjust the position of the motor later.


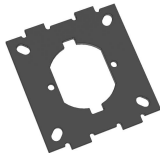
Assemble all the electronics to the top plate. A good way of doing that is by using Velcro and zip tie.

Take the two servo cable extensions and connect them to the channels on your receiver for your left and right elevon. Zip tie them to a spacer bolts for strain-relief. **The servo extension cables need to be in place for the wing to be able to detach during crashes!** Make sure the servo connector from the wing and the extension cable are easy to disconnect. If the connection is too strong, it puts a lot of strain on the cable. Use sandpaper or a file on your servo connector if the connection is too strong.

## 6.3 Camera mount

- Camera mount

Choose the appropriate camera mount.

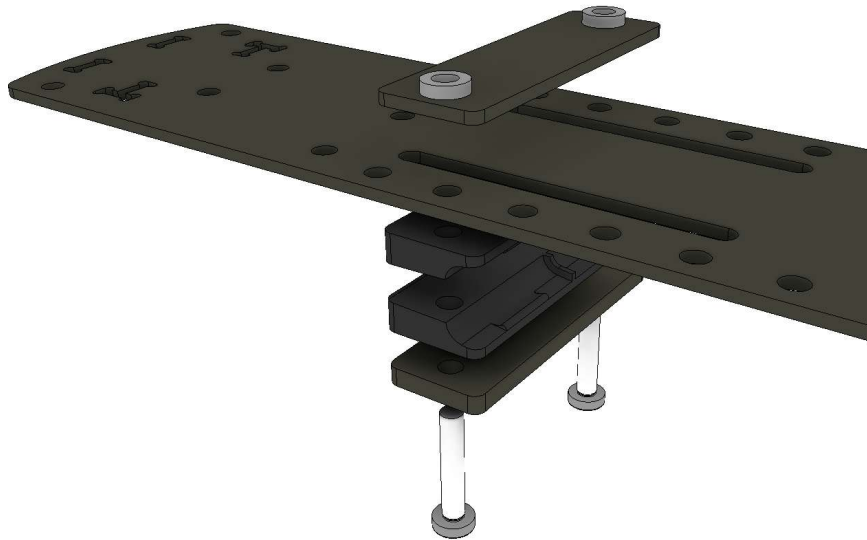
For HS1177 or Eagle-Eye style camera:	For board cameras:
 2x	 1x

Attach the camera to the camera mount.

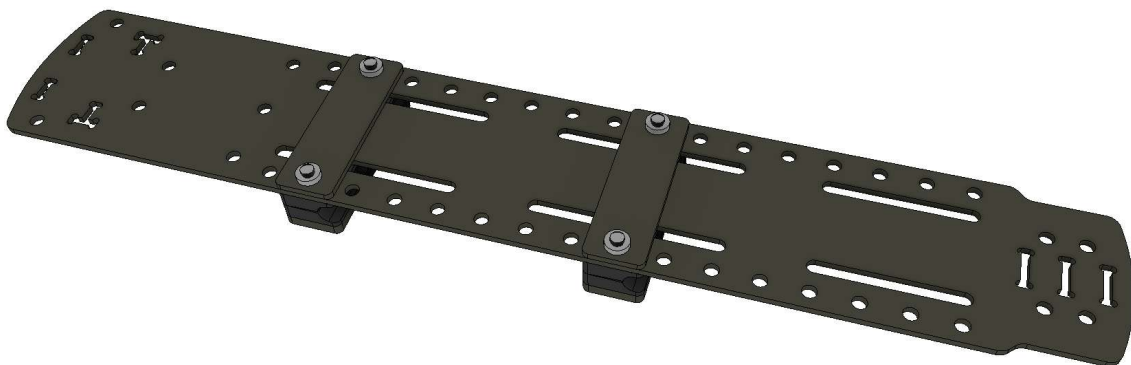
## 6.4 Wing mounts

- 1x Bottom plate
- 2x Wing mount A, B
- 4x Wing mount C
- 4x M3x16mm screws

The position of the first wing mount is in the second hole behind the 3 spacer bolts (or the hole 80mm from the front). Assemble the wing mount as shown in the picture below.



The second wing mount is 7 holes (or 70mm) behind the first wing mount. Take care, that the openings of both wing mounts point to the back. The positions can later be easily changed.

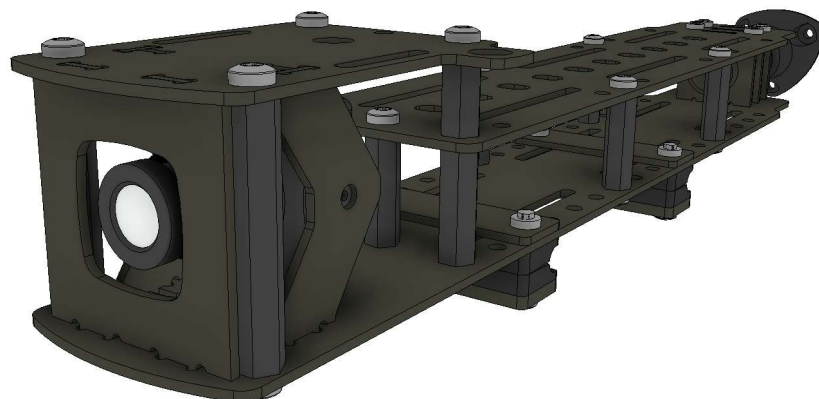
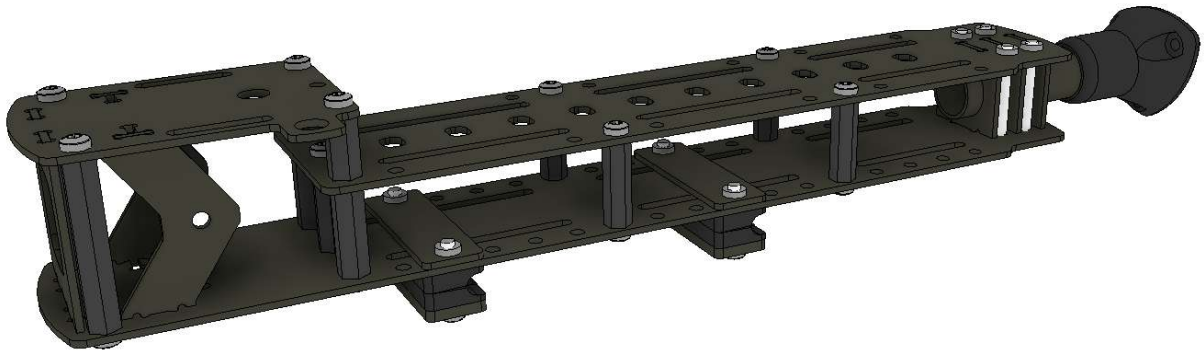


## 6.5 Attaching the bottom plate

- 1x Bottom plate
- 1x Assembled top plate
- 9x M3x10mm screws
- 4x M3x25mm screws
- Camera Cover
- Camera Mount with camera

Start attaching the bottom plate to the top plate and camera plate by fitting the tube clips into the bottom plate. Put the 25mm screws through the bottom plate and screw them into the press nuts on the top plate. Don't tighten the screws yet. See if everything fits together nicely.

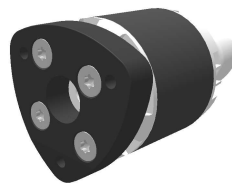
Add the camera cover and the camera mount to the front by fitting them into the corresponding slots. Use the 10mm screws to attach the bottom plate to the spacer bolts from back to front.



## 6.6 Motor

- 1x Motor plate
- 4x M3 x 8mm countersunk head screws
- 3x M3 x 10mm screws

Attach the motor plate to your motor with the countersunk screws. Check that the screws don't touch the motor windings.



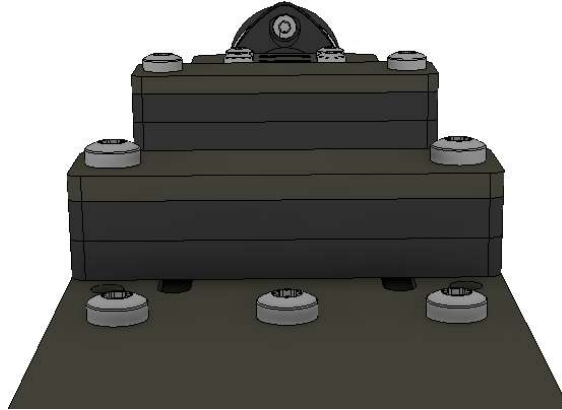
Remove the carbon tube with the motor mount from the fuselage. Screw the Motor with the motor plate to the motor mount. The screws need some force to be screwed into the motor plate. The motor plate sits flush with the motor mount and there should be a gap on one of the three corners.



This gap can be used to adjust the thrust angle to your liking later by loosening the screws on the corners without a gap and tighten the screw on the corner with a gap.

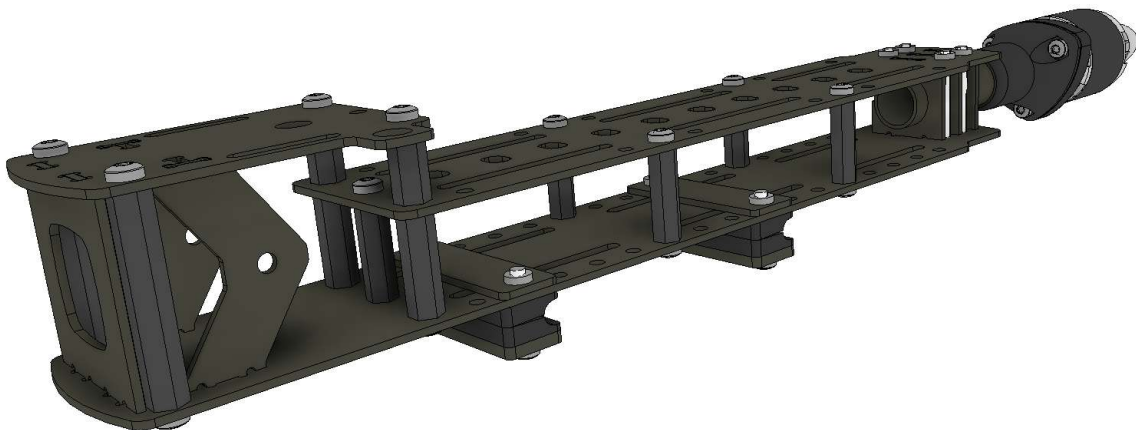
Take the assembled motor + mount and put the carbon tube back into the clips. Check that the corner with the gap is straight at the bottom.

By putting the fuselage upside down and aiming from the front of the bottom plate to the gaped corner of the motor mount you can easily check if the motor mount is straight.



Tighten the 4 screws of the tube mount.

The fuselage is now ready.



## 7 Flying

### 7.1 Attaching the Wings

Loosen the screws of the wing mount. Put one half of the wing with the carbon rods into the wing mount. You can connect the servos before or after you put the wings into the wing mounts

Make sure you push the wings in all the way. Tighten the wing mount screws on the side of that half of the wing you just pushed in. Make sure you tighten it firmly. Attach the other half of the wing. Check if the wings are correctly secured by holding each half of the wing with a hand and try to pull them out of the wing mount. You should not be able to move them.

## 7.2 Control surface

The control surfaces are used as ailerons and elevator. Use your radio to mix the signals appropriately.

Because the MiniRaceWing is a small wing, small variations have big effects. Make sure the elevons are firmly attached and that there is as little play as possible.

The maximum deflection for ailerons and elevator is slightly different. Use your radio to reduce elevator deflection.

If you have too much deflection for both, it is better to move the linkage at the servo horn a notch down than to use the radio to reduce deflection.

The MiniRaceWing is extremely agile. Make sure to use expo on both elevator and aileron. The amount of expo depends on your liking. Use the recommendation below for maiden flight.

The rudder has been set to be flush with the wing during assembly. You can either trim the elevator deflection with your transmitter or use the threads on the linkage to adjust initial deflection now.

Initial rudder deflection:	1mm up (For maiden flight. Trim for level flight later)
Max. rudder deflection:	7mm recommended for all pilots max. 10mm for full agility (In either direction, measured from the initial deflection)
Elevator deflection reduction:	80%
Elevator expo	25%
Aileron expo	10%
Aileron differential	0%

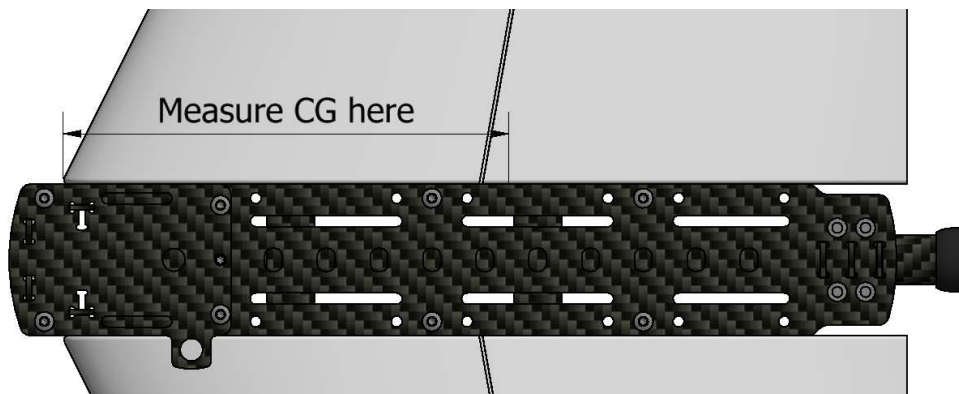
## 7.3 Center of Gravity

To adjust the center of gravity (CG) make sure your MiniRaceWing is fully assembled. The battery is attached and the Winglets are in place. Adjusting CG at small flying wings is critical. A millimeter back and forth can make a huge difference. Be thorough during initial adjustment and adjust only in small steps during test flying.

The CG can be varied between 130 and 135mm behind the leading edge of the wing.

At 130mm the MiniRaceWing is easier to start and handle. At 135mm the Wing is more aggressive and more efficient.

**Set the CG to 130mm behind the leading edge of the wing for maiden.**



It is easier to measure the CG, if you make a mark on the wing where you would like it to be.

Hold the MiniRaceWing upside down above you and place your index fingers on the wing on either side of the fuselage and try to balance the wing on your index fingers.

### **If your fingers are more than 1cm away from the CG:**

Remove the wings, unscrew the wing mounts and move the plates with the press-nuts to a better position. If your fingers are in front of the CG, move the plates forward. If your fingers are behind the CG, move the plates backwards. Put everything back together and measure again.

### **If your fingers are less than 1cm away from the CG:**

Loosen the screws for the tube mount and push or pull the motor to a different position. The extend effect will depend on the weight of your motor.

If your fingers are in front of the CG, pull the motor out. If your fingers are behind the CG, push the motor in. If the CG fits, tighten the screws.

If you can't adjust the CG to the right position with this measures, you could also move the batteries or add weight to the front or the back of the plane.



## 7.4 Maiden Flight

For the maiden flight, choose an area that you know well and has a lot of space and no people around.

The maiden flight should be done without goggles. If you haven't placed any decals yet, make sure the top and bottom of the wing is easy to distinguish. Two stripes of black tape on the bottom do the trick just fine.

Do your pre-maiden check:

- check for loose cables and connectors
- check if CG is correctly
- check if elevator direction is correct
- check if aileron direction is correct

Do a pre-flight check:

- check if the wings are firmly attached and fully inserted.
- check the control surfaces, motor and propeller.

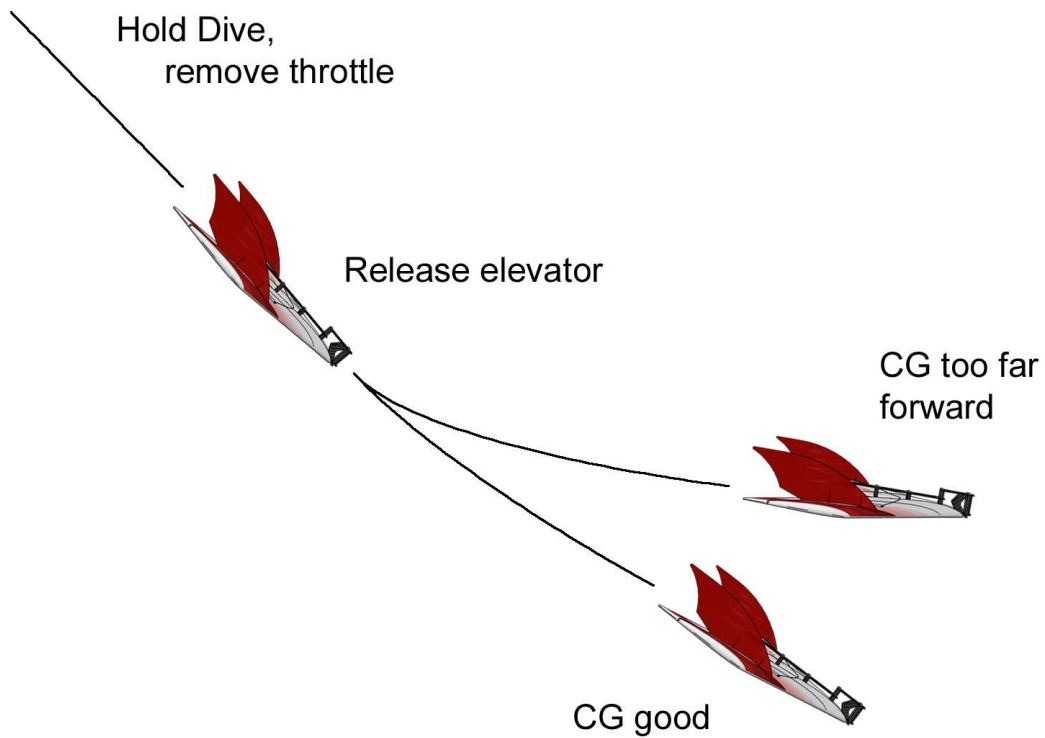
To launch the MiniRaceWing hold it at the leading edge somewhere in the middle of the wing half. Hold it next to you at an angle of roughly 30°.

Give full throttle and move your arm to give the plane a small pull. Don't rotate or push the plane in any direction other than the flight path. Release the plane.

If your plane pitches up immediately, either your release angle was too steep or the CG is too far back.

Climb to a safe height and reduce throttle. Trim your controls so that the plane flies straight and level.

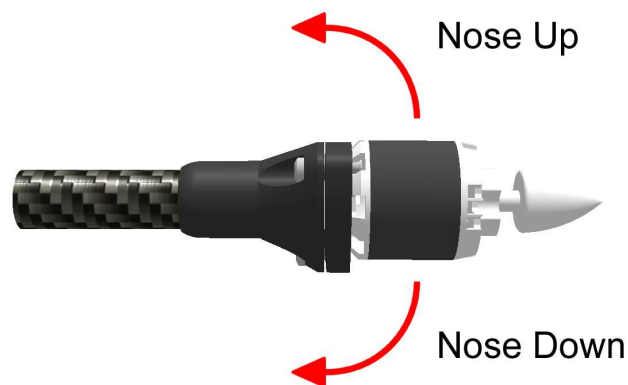
Test the CG position by climbing to a safe height. Then go into a steep dive and cut throttle. Release the elevator and check what the plane does.



Land and adjust CG until the test shows the CG position is correct.

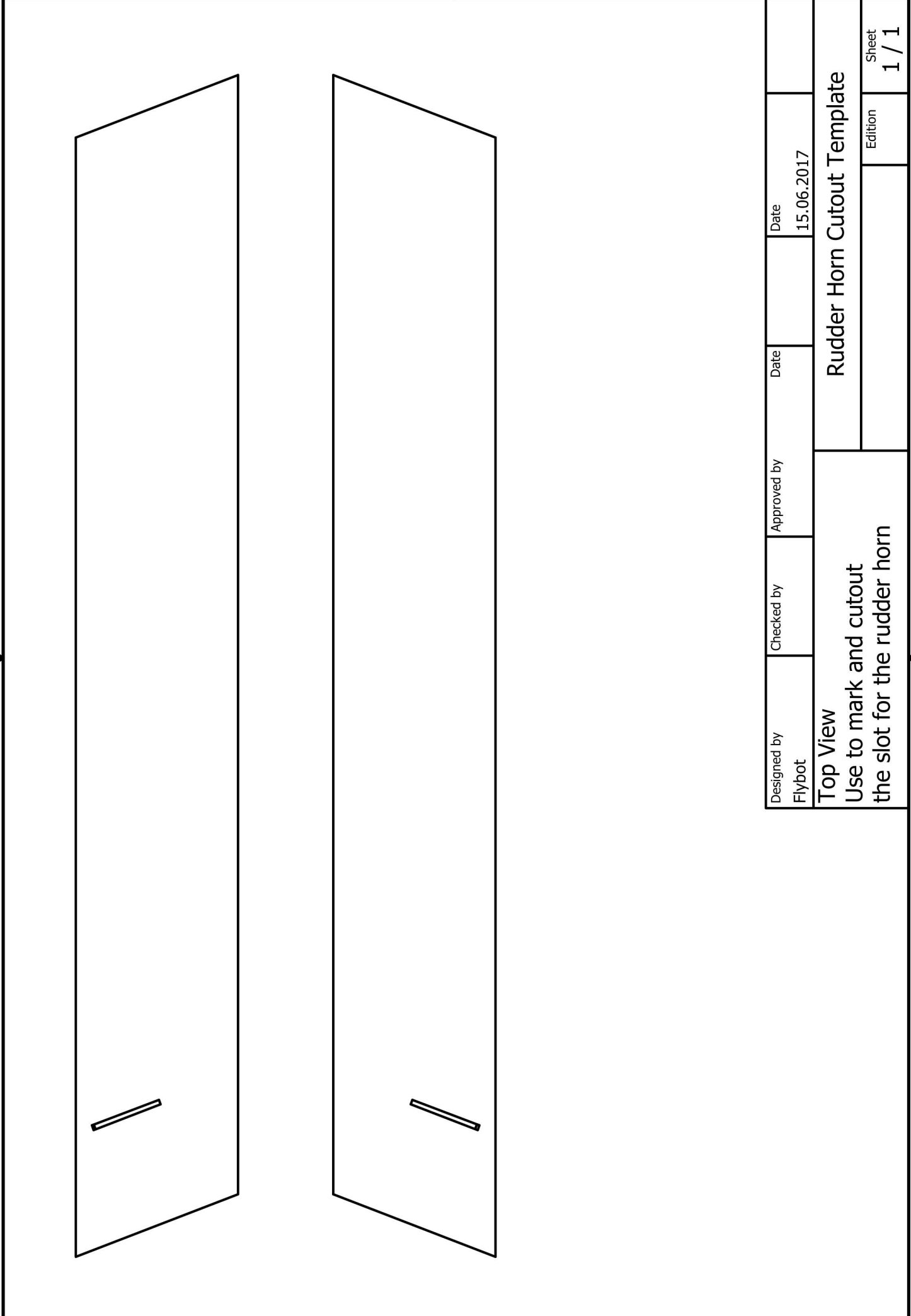
## 7.5 Thrust angle

To test the thrust angle fly level flight at 50% throttle and give full throttle. If the MiniRaceWing keeps flying level, thrust angle is perfect. Otherwise see the picture below how to adjust it:



# 8 Troubleshooting


# 9 Templates



Designed by Flybot	Checked by	Approved by	Date	Date 15.06.2017
Top View Use to mark and cutout the slot for the rudder horn			Rudder Horn Cutout Template	
			Edition	Sheet 1 / 1