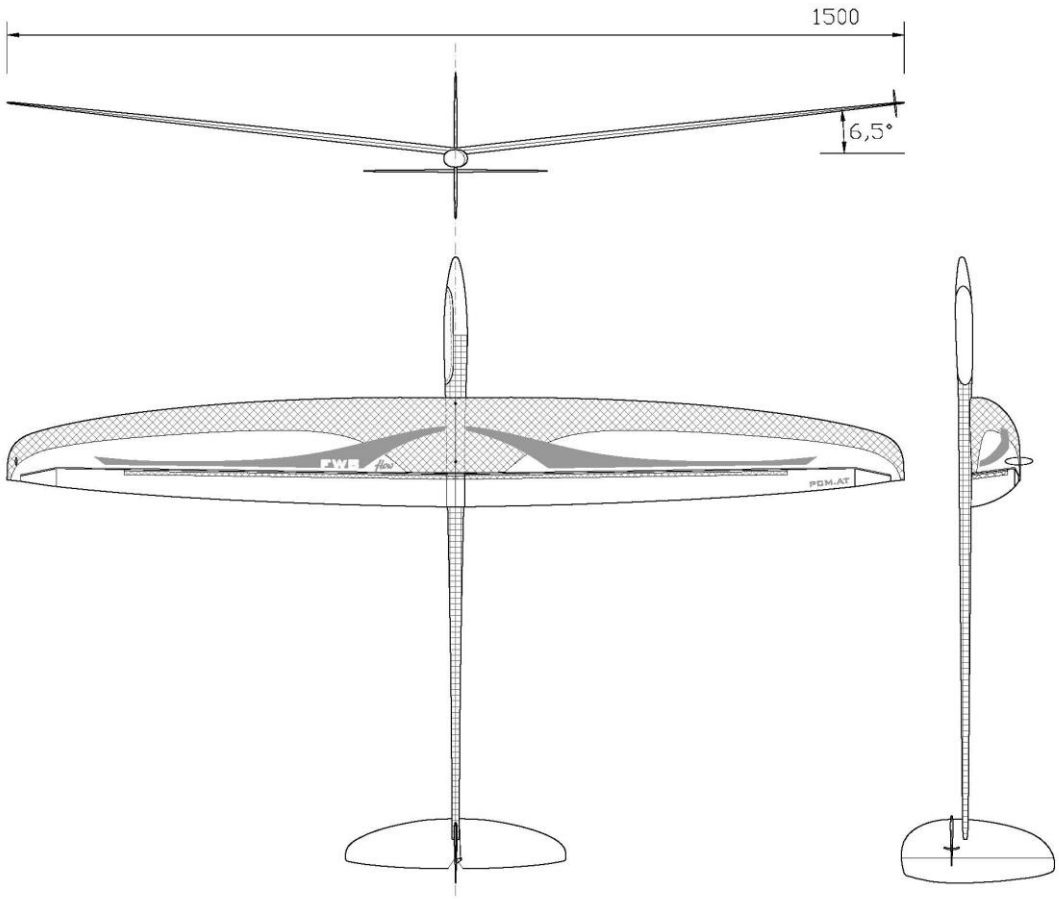
| | |
|---|---|
| Wing span [mm]: | 1500 |
| Wing area [dm2]: | 22,4 |
| Aspect ratio: | 10 |
| Take-off weight [g]: | from 250 |
| Airfoil: | Zone 52-21 |




# BUILDING INSTRUCTION

**SAL-DLG FW5 FloW**

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## DATA

### 1. Kit – contents

Fuselage + canopy
Wing
Rudder and elevator

Radio board
Carbon rods for fixing the elevator, 2 pc.
Lever for controlling rudder, 1 pc.
Kevlar wire for controlling rudder
Steel wire for torsion spring (rudder), 1 pc.
Brass pipes for levers of ailerons, 2 pc.
Carbon pipes for push rods for controlling ailerons, 2 pieces
Screws for fixing wing, 2 pieces (1x 25mm)
Throwing blade, 1 pc.
Magnets for lock of canopy
Lead balls for ballast
Steel wire (1,2mm) for ballast

Building instruction

### 2. What else do you need:

Epoxy-glue (for example UHU 300 endfest or Stabilit, no fast hardening epoxy resin)
UHU POR
Super glue
Cotton flocks

Electrical equipment (On/Off-switch, cables, plug, ...)
Electronic equipment
Steel wire, shrinking tube...

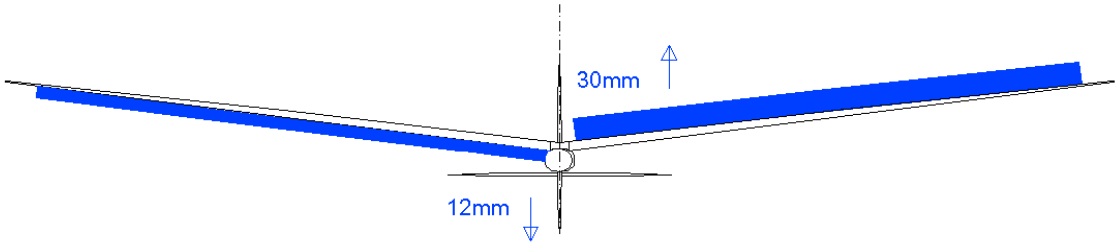
### 3. Electronic equipment

| | |
|---|---|
| Servo elevator | - Graupner C 261 (cuttings on radio board are prepared for this servo)<br>- Graupner DS 281<br>- Hitec HS 5045HB |
| Servo rudder | - Dymond D-47 (cuttings on radio board are prepared for this servo)<br>Same style:<br>- Futaba FS31<br>- Modell Expert X31 |
| Servos aileron | - Graupner C 261 (cuttings on radio board are prepared for this servo)<br>- Graupner DS 281<br>- Hitec HS 5045HB |
| Accumulators: | - GP NiMH Accu 35AAAH, Weight/cell 6g<br>(1,2 Volt 0,35 Ah 1/2AAA)<br>- 240mA/h Li-Ion Accus, 2 pc. parallel with pusher |
| Receiver: | - 2,4GHz possible due to kevlar fuse cone |
| Logger: | - Logo<br>- Lola<br>- Ram3<br>- Z-Log |

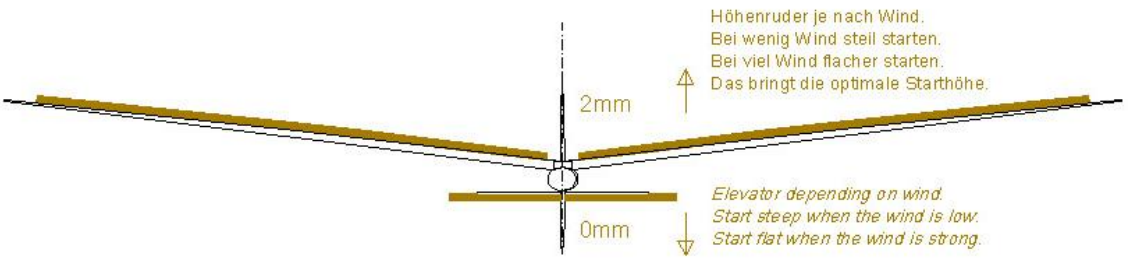
## 4. Settings for the first flight

**Centre of gravity: 65-70mm** (measure from the leading edge of the wing to the back)

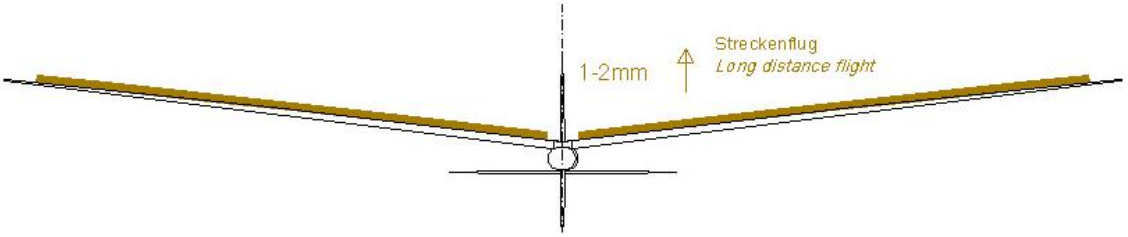
**Ailerons** (measure near fuselage)



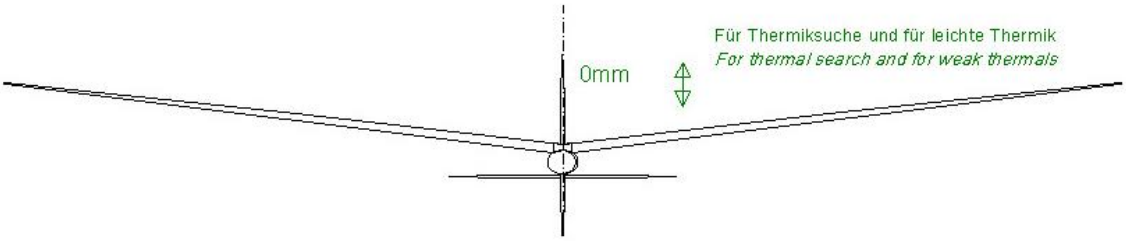

**Flaps negative (start, speed)** (measure near fuselage)



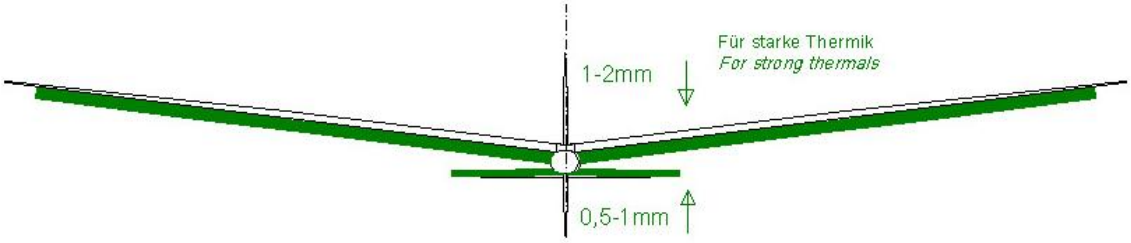

**Flaps negative (cross-country)** (measure near fuselage)



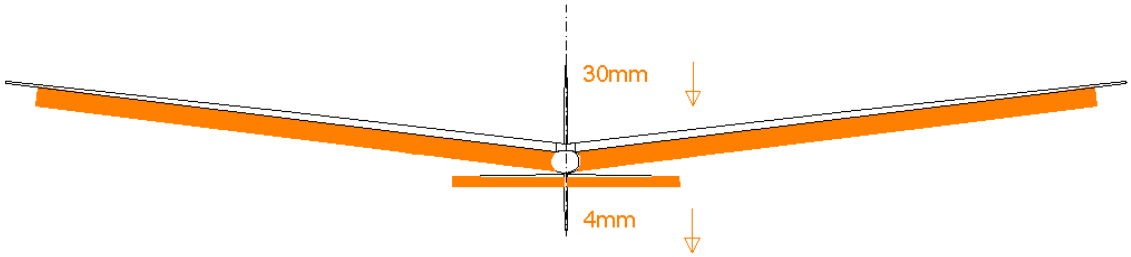

**Flaps positive (thermal 1)** (measure near fuselage)



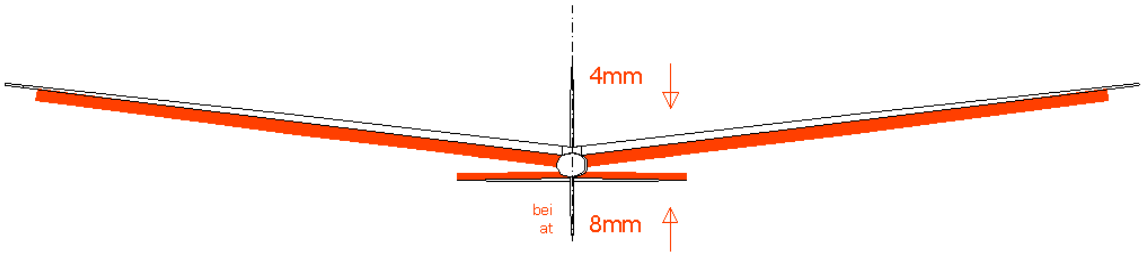

**Flaps positive (thermal 2)** (measure near fuselage)



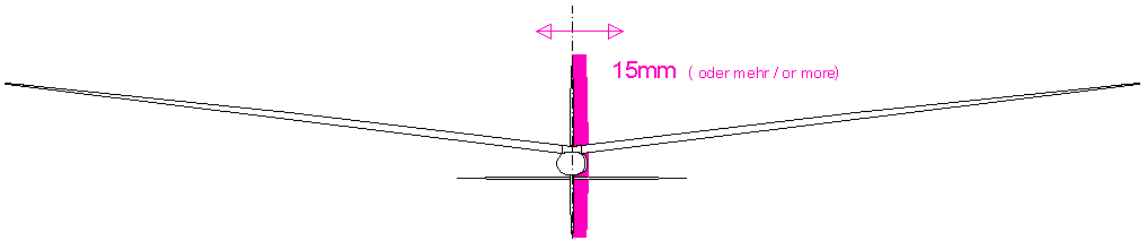
**Landing position** (measure near fuselage)




**Snap Flap** (measure near fuselage)




**Rudder** (measure at deepest point)




**EWD** (Difference in angle of attack between wing and elevator) **for first flight:**
Elevator parallel to axis of fuselage, slightly pulled.

**Don't make a SAL-start at your first flight. Hold the glider on the fuselage and throw it gently.**

## ASSEMBLING THE MODEL

### General information on DLG-models

DLG-models are constructed strong enough to withstand the demands of starting, flying and landing and at the same time light enough to achieve the least possible flying weight. Each part is dimensioned to its possible minimum and produced using lightest and fewest material.

In order to continue this concept, please account the following when you assemble the model:

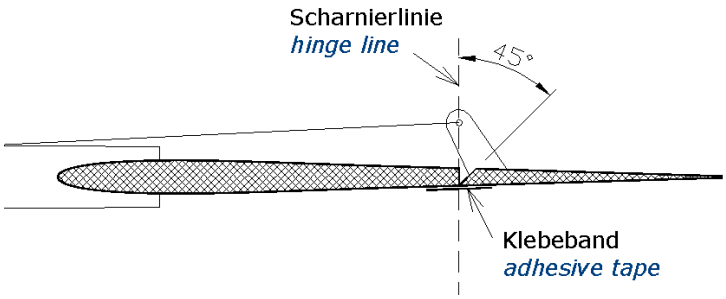
- Always **use glue sparingly**. **Grind** all gluing spots **thoroughly**, before you apply the glue.
- **Electronic components** should be **placed as far as possible to the front,** as you normally need additional lead in the nose of the fuselage to achieve the necessary centre of gravity.
- For the same reason try to **save weight** especially when you **finish and mount the stabilizer**.
- If you don't have any experience in working with resin or if you prefer an easier method, you can combine the **carbon rovings and glass fibre with super glue**: Put some drops of super glue on the rovings or the fibre, spread and press it with a (rustling) plastic bag. You will also save one or the other gram with this method.

As FW5 FloW has developed from the Fireworks-family, you will find some pictures of Fireworks 4 and also Mini-Fireworks in the following instruction. Don't let yourself be confused by this, the way of building described is quite the same.

## 5. Installation of the CFR-stab

Sand the rudder **wedge-shaped** on the **hinge line**, so that you can move it in both directions. Note that the **hinge line** must be placed **on the left side** (looking towards flight direction) for **right-handers** and the other way round for left-handed persons.

Rudder for **right-handers** (view from above)




Next, glue the **lever** in extension of the axis of the boom. The **hole of the lever** should be **above the hinge line**.

Before you fix the control surface of the rudder with **adhesive tape**, put some **UHU-por** on the gluing spots to improve the gluing force of the tape.

Spread the UHU-Por with your finger.

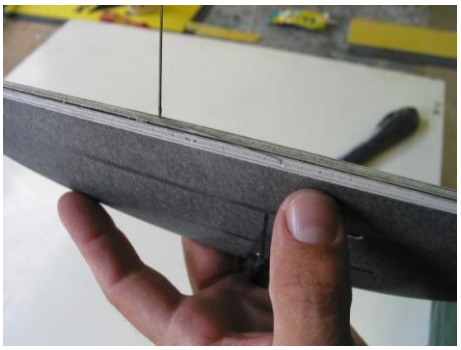
**Fix** the **rudder** with 2 **small stripes** of tape to keep it in the right position. (As soon as you have applied the tape on the UHU-por, you can't remove it anymore without destroying the surface.)

Now you can **apply the adhesive tape**.

## 5.1 Torsion spring for rudder

**Bend** the wire according to the drawing below. Then, **tip back** the **control surface** of the rudder completely. **Stick** the spring **into the rudder,** one end into the unmoved part, one end into the control surface near the lever.

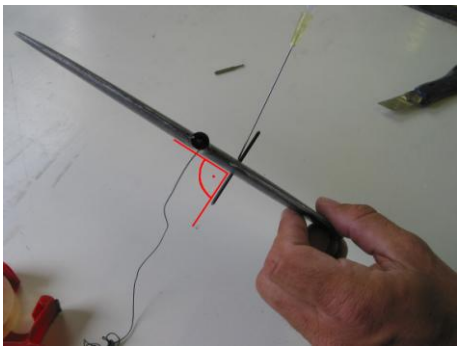

Then **harden** the spots **with super glue**.



Fix the **carbon rod (2mm)** with superglue **in the rudder**. Now you can mount the elevator.

The elevator will keep the distance between the two carbon rods. If you move the spring without the elevator mounted, the spring may disappear inside the rudder. Only when the elevator is mounted, the spring will move along the track cut out.

Nevertheless, **check the elevator for free movability**. If necessary, enlarge the hole in the rudder.



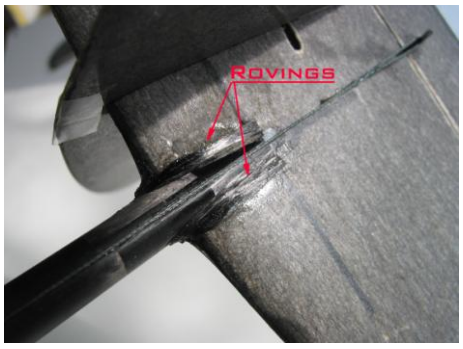
**Push the rudder** (first for a test) into the oval end of the boom as far as it will go. Before you do so, thread the kevlar wire into the fuselage. **Grease the wire** to avoid that it will also be glued.

Then check, if the stabilizer is **aligned correctly** on each axis.

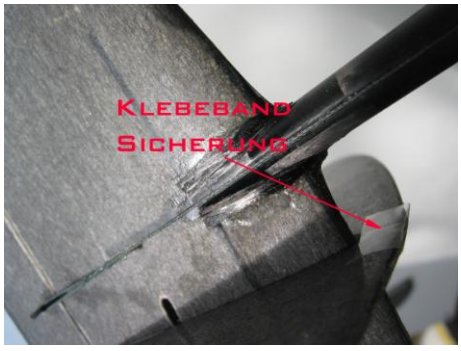
Now **glue fuselage and rudder** with **thin super glue**, where they touch each other.

In order to **fix** the tail **in the correct position** during bonding, you can use a small screw clamp.

You should **enforce the join** between boom and rudder additionally with a thin **carbon roving**, which you glue with **thin super glue**.

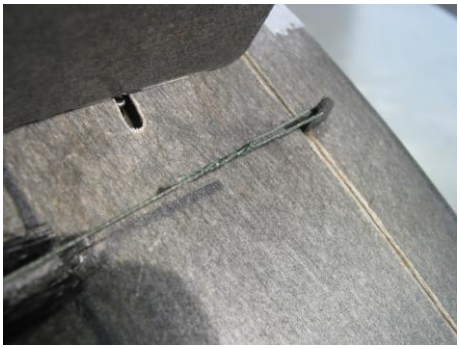



Stick the 2 halves of the elevator to each other **on the leading edge** with an **adhesive tape** to avoid unintended demounting during start or flight.



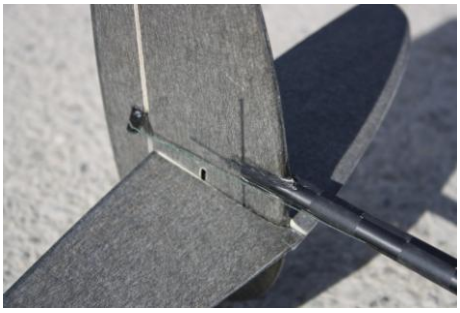
### 5.2 Connection of the wire

Now you can **hook in the kevlar wire** into the lever.

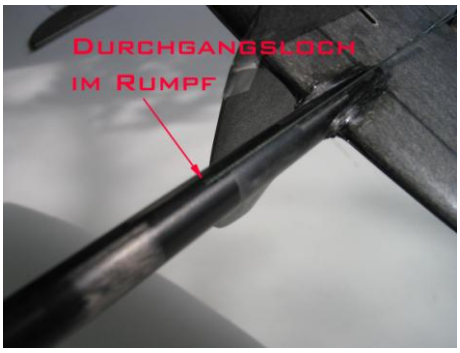


Make a **loop, twist the end** and fix it with a **drop of super glue**.

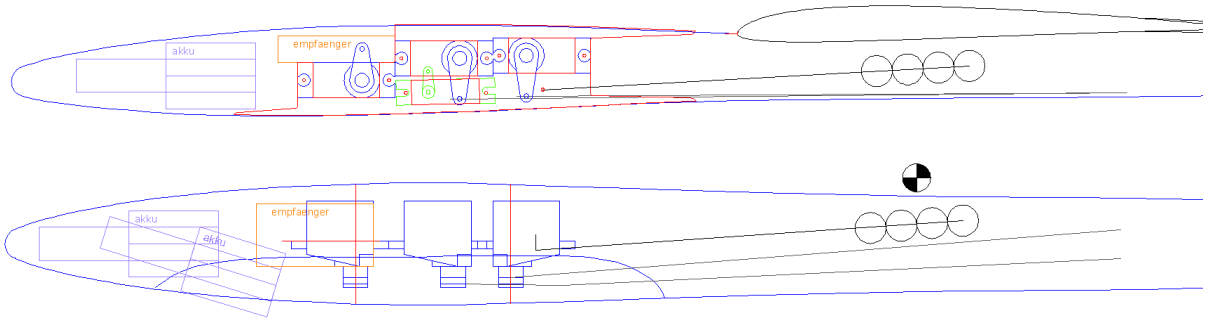
Note: Don’t use a shrinking tube, as the kevlar wire could be damaged by the high temperature during shrinking.



**Drill a hole in the boom** to lead the wire inside the fuselage to the servo.




## 6. Fuselage structure




(Systemzeichnung)

### 6.1 Radio board

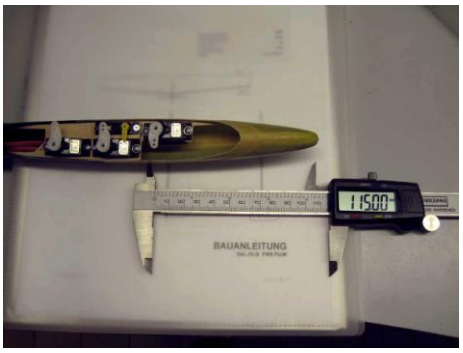
At the moment we recommend the servo **Graupner C261**. Therefore the radio board which is enclosed in the kit has cuttings prepared for this servo. For the **rudder** we still recommend **D47 from Dymond**. (On the model in the picture we used the X31, which is the same.)

The assembly plates of the D47 are situated a bit deeper than the ones of the Graupner servos. Therefore we supply a **U-formed part** to put below the assembly plates and lift the D47 to the same height.

These are the tried and tested **lengths for the levers of the servos**:
Lever for aileron: 13mm
Lever for elevator: 10mm
Lever for rudder: 9mm

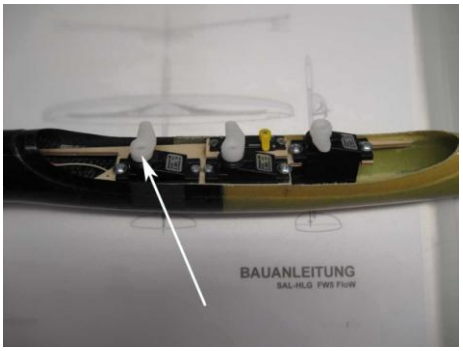
The servo for the elevator is situated in the front, the servos for the ailerons behind and the servo for the rudder is placed under the servos for the ailerons.

In order to **gain full strength**, it is absolutely necessary to **fix the radio board** in the fuselage!



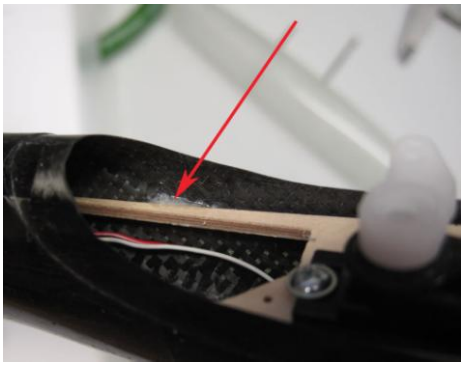

Before you glue the radio board, you should first **find out the optimal position.** To do so, place the radio board inside the fuselage without gluing and mount all servos. The front aileron servo should be situated 115 mm from the fuselage Tipp.

Make sure that all **levers are freely movable** (also with canopy mounted), and that the **deflections** of the levers are big enough. Note that the pushrods for the **ailerons must be lead beside the ballast**. (see drawing at the top).




Before you fix the radio board in the fuselage, **grind all gluing spots** thoroughly.

You can fix the radio board with a **drop of super glue** to make the position check easier.



Glue the board carefully **with epoxy-glue** (for example UHU 300 endfest or Stabilit, no fast hardening epoxy resin).
You can fill the glue into a small plastic bag and cut a whole on one corner. By this, it will be easier to apply the glue exactly.

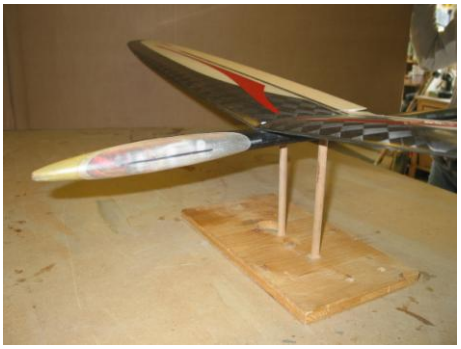
You can add **carbon rovings** left and right of the gluing spots for additional strength.

If you have a **hard landing**, always **check** if the radio board is still fully glued before you make the next start!

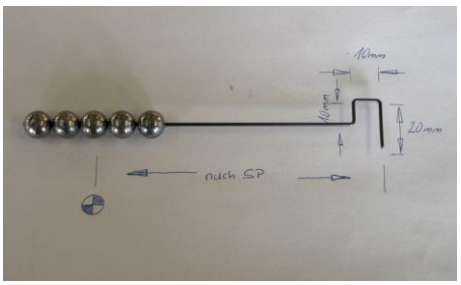
## 6.2 Ballast

As ballast we use lead **balls** from the **fishing shop**. One ball weighs about 10g. You can easily assemble and vary this kind of ballast.

The balls are strung on a **steel wire**. With a small **hook** at the end of the steel wire the ballast can be **locked** on the radio board.
To locate the exact position of the ballast inside the fuselage, lay the model on a **device for measuring the centre of gravity** (see picture). Move the ballast until you get the desired centre of gravity.

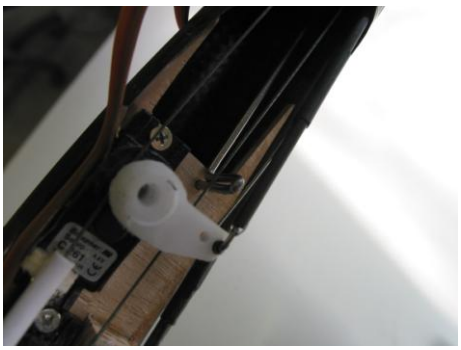


When bending the wire you should make sure that you **don't create 180 ° curves**, as the wire may break then.




The **long screw**, which fixes the wing in the front, serves as **separation** between ballast and push rods. When you mount the ballast, thread the wire with the balls into the fuselage left of the front screw.

The **hook** of the ballast package is **locked in the servo board**.



### 6.3 Accumulator and receiver

Depending on the size of battery and receiver different ways of shapes for the accumulator package are possible.

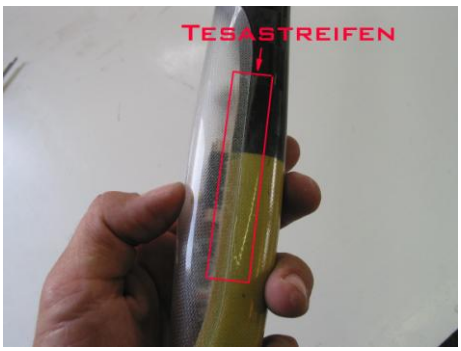
In any case, we recommend to **assemble the battery cells** with **adhesive tape** first. **Check**, if it fits inside the fuselage together with the receiver, before you solder the cells.

At the side you see two possible shapes for the battery package.

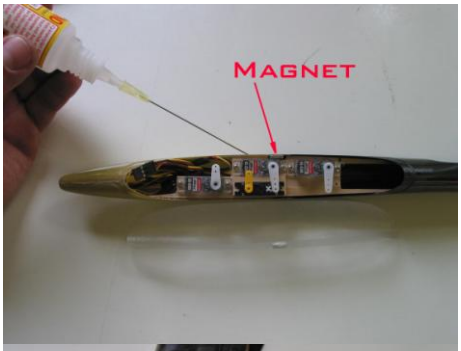
If you want to use a big **8 channel 2,4 GHz receiver**, you can remove the plugs and **solder the servos directly onto the board**. With our indoor colleagues this is already quite normal.

### 6.4 Canopy lock

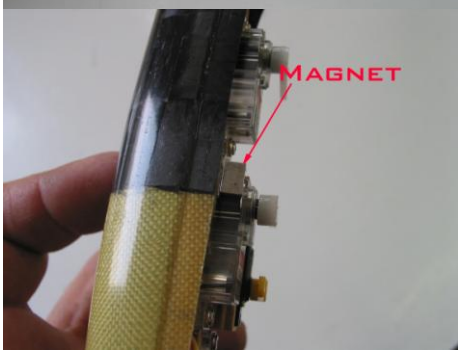
The canopy is fixed with **adhesive tape** on the bottom and can be closed with **two magnets** on the upper side.




Glue the **first magnet** on the **radio board** on the upper side of the fuselage with super glue.




Then put the **second magnet onto the first one**. The magnet should be **sanded** as well as the inside of the canopy. Now put a **drop of super glue** on the second magnet and spray **activator into the canopy**. Then you lift the hood carefully over the magnet in the desired position. You should **check the good fit** of the canopy before, as this process defines the position of the canopy.




Wait a few seconds, then you can strip off the canopy and close it again. **Check the fit** of the canopy. If you are still not satisfied with the fit, you can easily break the magnet out of the canopy again.
When you are satisfied with the position of the magnet, you can **put more glue** around the magnet to improve the join.

### 6.5 Installing 2.4 GHz

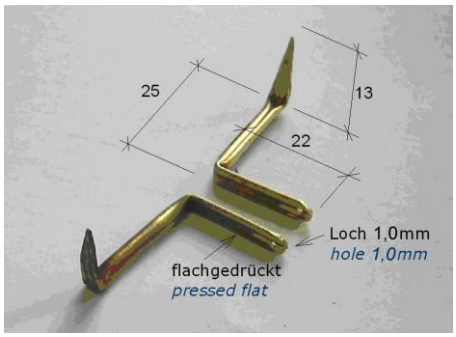
The installation of the **2.4 GHz receiver** should be in the **front of the fuselage**, where the fuselage is made of kevlar. Make sure that the antennas are not covered by the receiver battery. That means the antennas should be placed directly **on the side of the fuselage**.

## 7. Controlling the ailerons

### Connection of levers

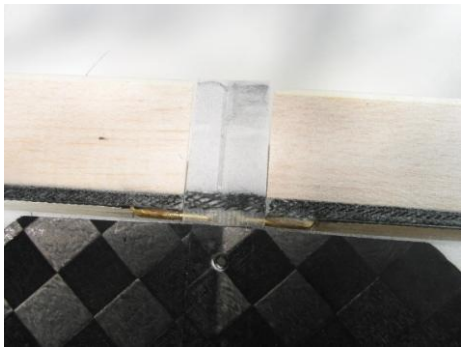
**Bend, press and grind** the **brass pipes** according to the picture.

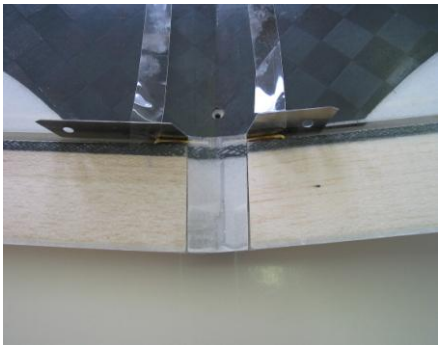
Drill holes with a diameter of **1mm** for hooking in the push rods.




Glue the brass levers **with thickened epoxy glue or epoxy resin** to the ailerons.

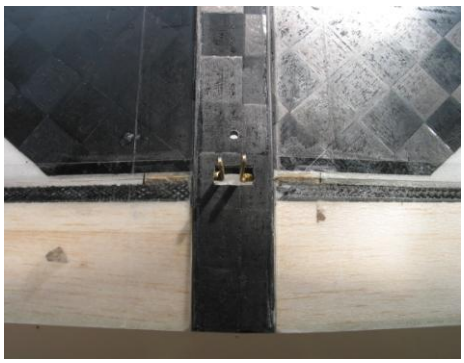
The levers should be situated as **near** as possible **to the turning axis** of the aileron.

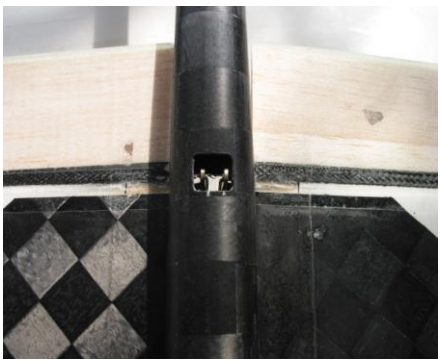




View from below: You see the brass levers standing out.

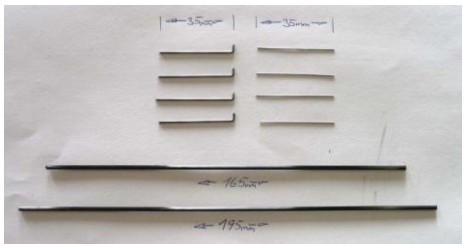
The 2nd picture shows the fuselage with its whole for mounting the wing. Use a **pair of tweezers** to mount the levers through this whole.

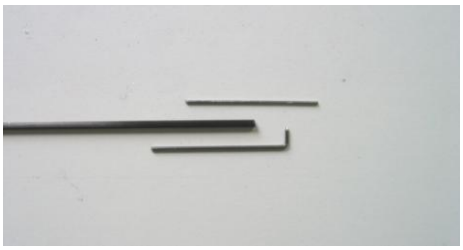




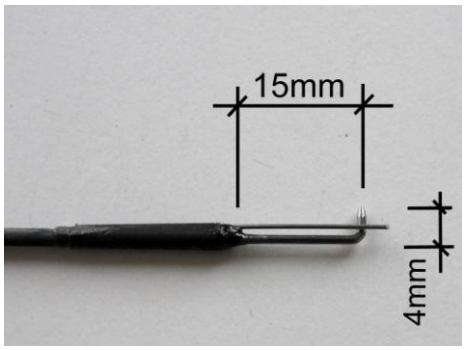
## 7.1 Push rods

The push rods are made of 2mm **CFR-pipes**, into which you glue a **bent 1mm steel wire**.



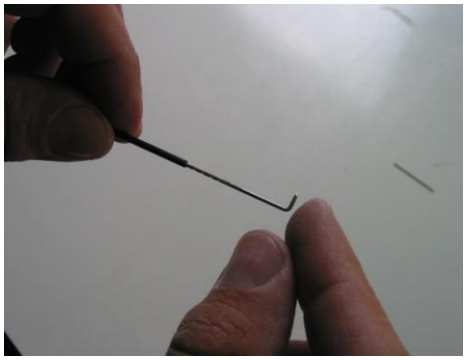


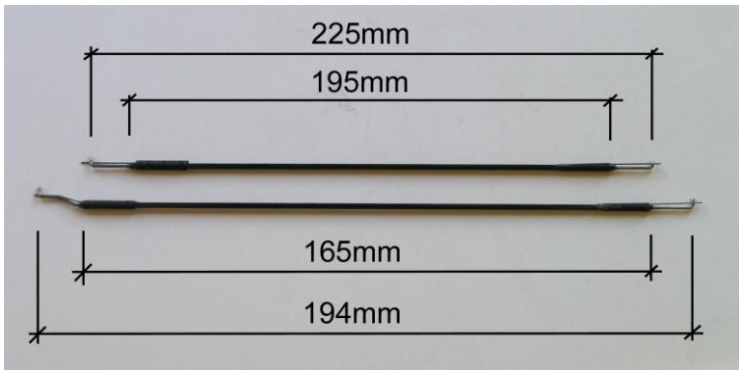
A **0.5-0.8mm steel wire** will serve as **protection** against dismantling. The parts are held together with a shrinking tube.




First you must **sand** the hook **thoroughly**.

Then you drop **thin super glue** on the prepared spots and push the hook into the pipe.





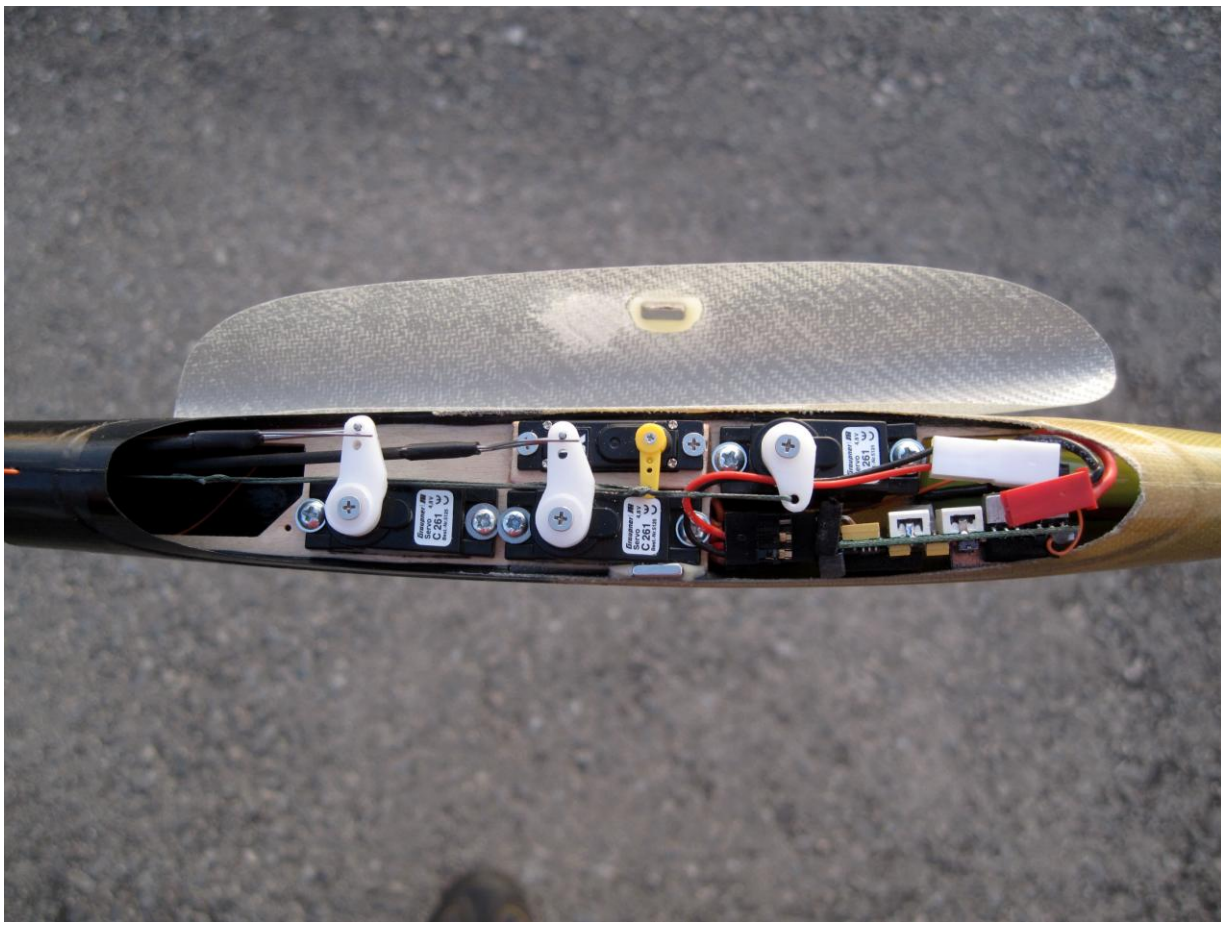


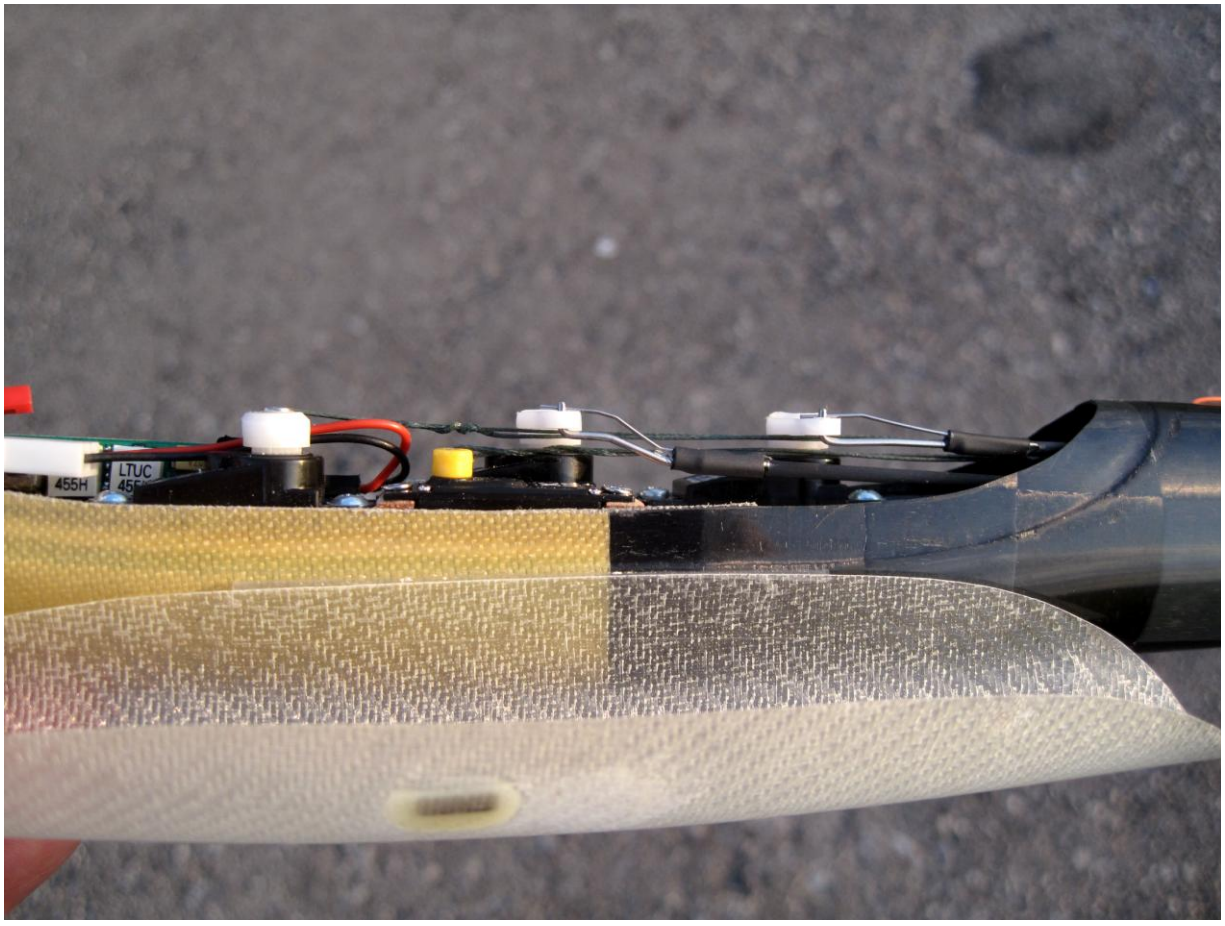
Before you glue the hook on the other end of the carbon pipe, mount the push rod in the fuselage and switch on the radio control. Fix the hook after trimming **in the right position** with **super glue**.

Note that you must **pull out the hook** to **apply super glue** and then push it back again.

It is **not enough** to let the super glue run into the pipe when the hook is already inside.

For the right aileron a **cranked hook** is required, so the pushrods don't interfere with each other. (See also lower large photo on the next page.)

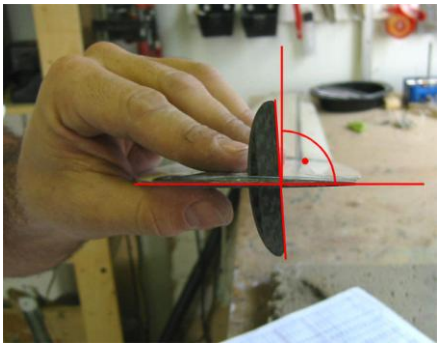





View from below

## 8. Installation of the throwing blade

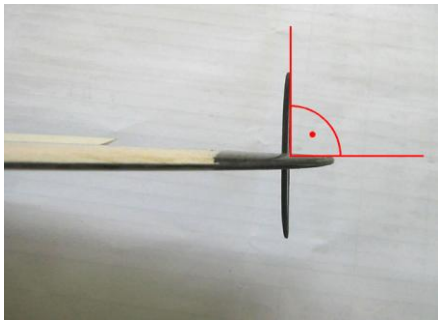
### Alignment

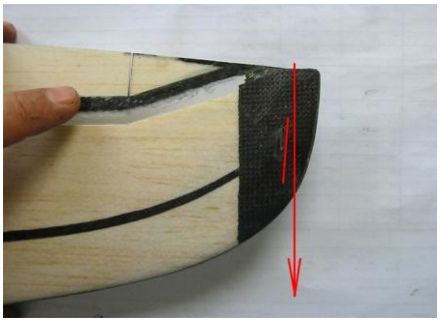


**Side** view:
**Tilt** the blade **on the upper side** of the wing a little bit **in the direction of flight.**

**Front** view:
Mount the blade **right-angled to the wing**.

View **from above**:
**Turn the axis** of the blade a little bit **to the fuselage** (looking in direction of flight).





Grind the blade, so that it gets an **aerodynamical cross-section** and it **feels handy** when you hold it in your fingers. Don't make the trailing edge too sharp. You might injure yourself when throwing your DLG.

Lay the **paper template** on the wingtip and **thrill a hole at the marked spot.**

(Both wingtips - left and right - are prepared for the installation of a throwing pin or blade.)

**Mark the length** of the blade.

Remember, that the axis of the blade should be turned a little bit to the fuselage (looking in direction of flight).

Now **cut an opening** into the wing with a small driller or a milling cutter.

If the cut is big enough, **put the blade through** and **align** it in all directions (see above).

When the position is correct, **fix** the blade **with super glue**.

Ready mounted throwing blade

You should additionally strengthen the joint by **forming a rim of glue**. Use f.e. UHU 300 endfest oder Pattex Stabilit.

## 9. Optimizing

### 9.1 Centring the masses

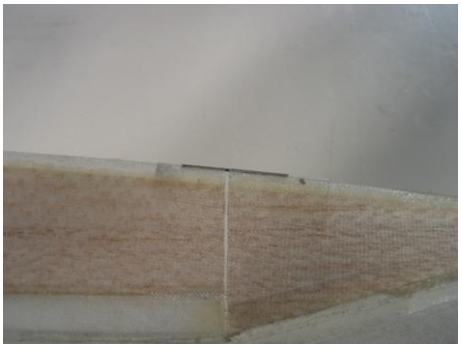
During our extensive tests we have found out, that **centring the masses in the middle of the glider** is even before the take-off weight the most important fact to **optimize the throwing height**. That means it is better start with ballast in the middle of the glider than to start very light. Every pilot should optimize his model, so that he can easily handle the weight of his glider when launching it, but carry as much ballast as possible. In addition, the amount of ballast of course also depends on the wind and thermal power.
As you see, there are still many ways to optimize.

**Mark Drela** has developed a method to **measure the yaw of gyration**. This defines how good or bad a glider has centred its masses:
Hang your model upside down on two 1,5m long threads, which you fix 30mm from the centre of gravity. Now move the glider for 45° and the let it swing. Take the time of 5 swings. Repeat this process several times to get an average value. The faster the model swings, the faster it will stabilize after the launch and the higher it will start.

#### 9.1.1 Flightpath during start

You could reach more starting height when you adjust the flightpath to the wind strength. When the wind is weak you should start very steep into the sky. And when the wind is strong the flightpath should be much more flat.

### 9.2 Ends of the ailerons



In order to move the triangular ends of the ailerons, stick a **0.5mm steel wire** with adhesive tape on the trailing edges of both control surfaces.

### 9.3 Leading edge of the wing

As you nearly don't recognize a damage of the leading edge of the wing (f.e. after hard landing), we advise to put a **strip of adhesive tape over the leading edge**.

The film is thin enough not to disturb the aerodynamic, but it surely will extend the lifetime of your glider.

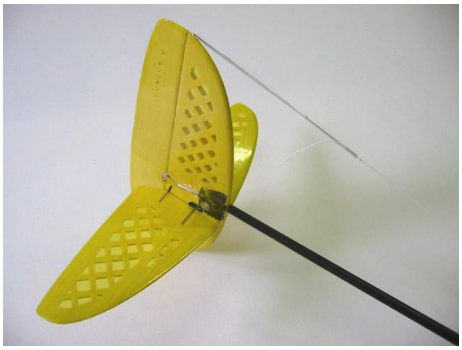
### 9.4 Voltage control

We recommend **DLG-saver from Simprop** against power failure of your glider.

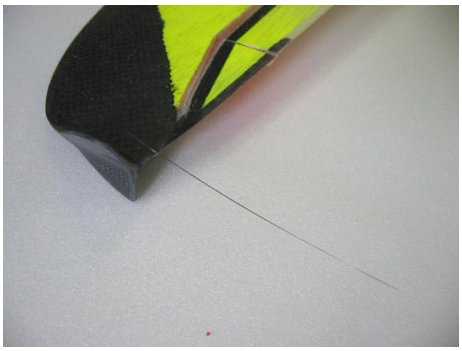
## 10. Installation of antenna 35Mhz

In order to have an undisturbed reception a **part of the antenna** must be situated **outside the model**.

An easy solution is to **fix the antenna to the end of the elevator**. Lead the antenna inside the fuse behind the wing and then leave the fuselage.



Another possibility is to lay the antenna **inside the gap of the aileron**. For improving reception on **carbon wings** you can solder the antenna to a steel wire, d=0.3mm, which you fix at the end of the wing and let stand out to the back about 10-15cm.



Always **TEST THE RECEPTION** on ground before you fly!

**For installing 2,4 GHz:** look at chapter “fuselage structure”

**OTHER**

**11. Check list before starting:**

1. Check **centre of gravity**
2. Check **control surfaces**:
   Do control surfaces move in the correct direction?
   Check the greatest swings
3. Check **reception**:
   Leave the antenna inside the radio control and go away from the glider up to a distance of about 60m. The control surfaces should not tremble.
4. Check **control surfaces before each flight.**
   Do all control surfaces still move correctly?
   Is there enough power in the accumulator?
   Are the brakes retracted?
   You can save the retraction of the brakes in your start setting. By this, you can never start with extended brakes.
5. **Gentle launch** from the fuselage. No DLG-launch at your first flight. If there are some wrong settings, everything will go too fast at the disc-launch to correct these failures by steering.
6. **Fix the 2-part-elevator** with an adhesive tape to avoid unintended demounting.
7. Install a **voltage control**. Digital servos and the 2,4Ghz system need more power, especially when it is very cold

**12. Notes for the use**

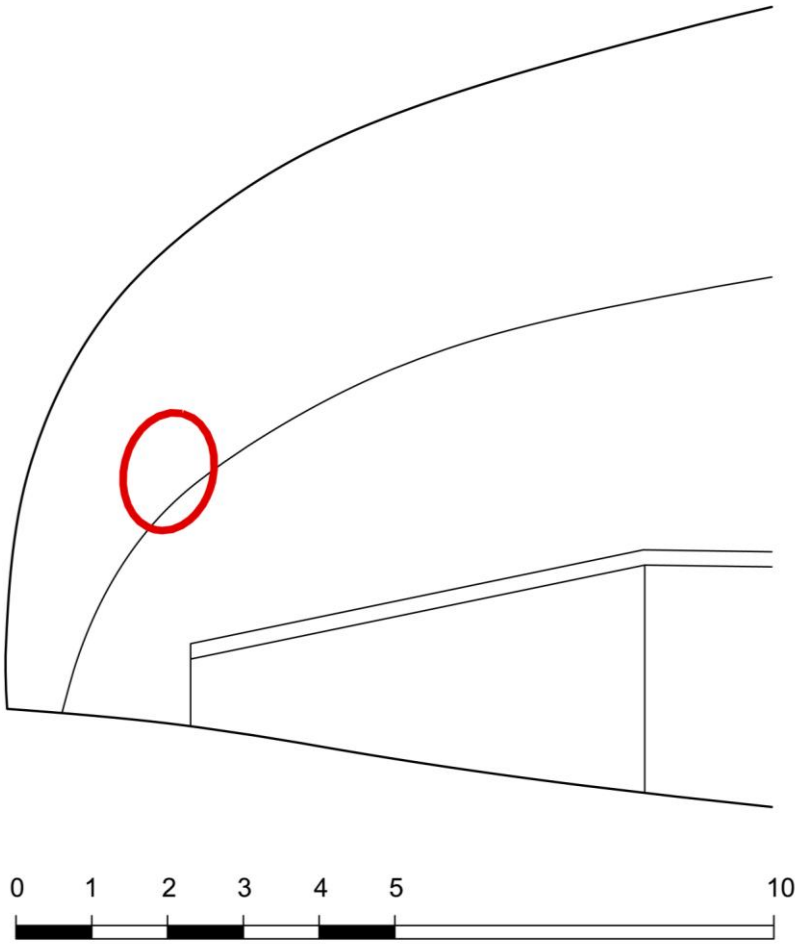
To avoid heating of the carbon surface, models with carbon wings should **not** lie **in the sun**.

**During flight** heating by the sun is no problem, as the model is **cooled by the wind. On ground** the glider should be kept **inside protective bags** or **in the shade.**

After every **ungentle landing**, you must **check your model for possible damage**, such as:

- Is the radio board still glued thoroughly?
- Did the leading edge of the wing burst open?
- Did rudder or elevator get damaged?

**Even a small damage could lead to write-off at your next launch!**




Template for the blade