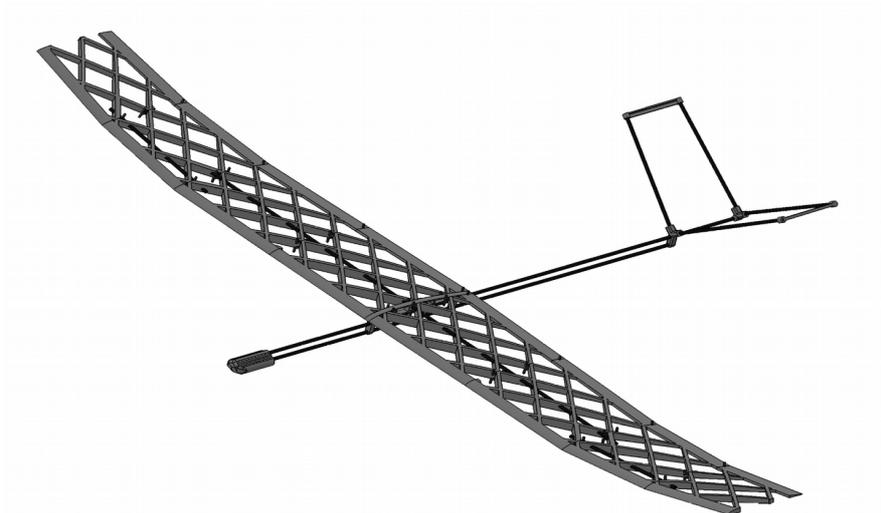


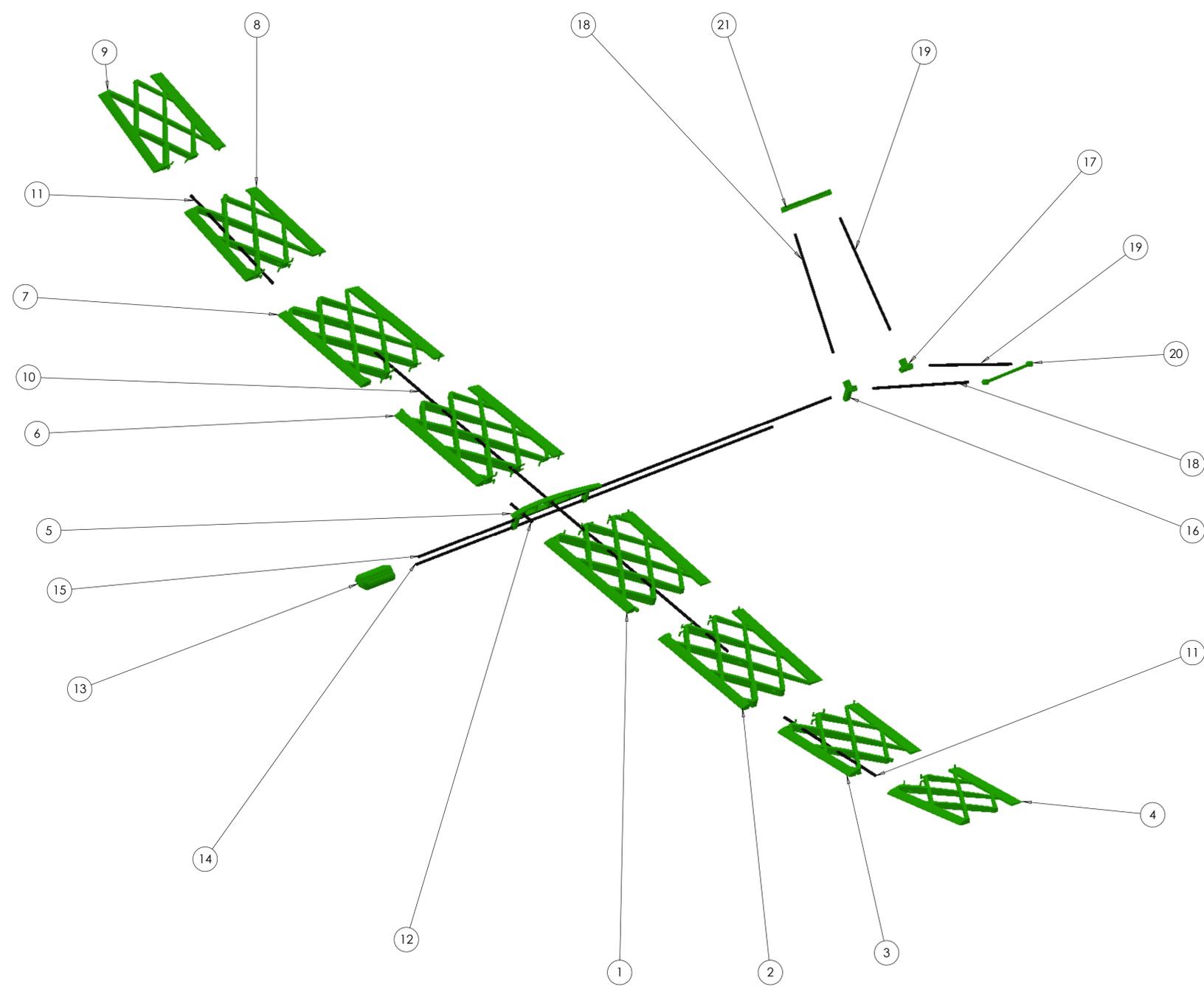


Tere build guide 1.0



Please do not share files that you bought

Development of a new plane and support of the old ones is very time consuming. Only with your help I can focus fully on this project and spend some quality time with my family.



KRAGA Tere

| PART NO. | PART NUMBER | PRINT AS | QTY. |
|----------|--------------------------|----------|------|
| 1 | wing_L_0 | SHELL | 1 |
| 2 | wing_L_1 | SHELL | 1 |
| 3 | wing_L_2 | SHELL | 1 |
| 4 | wing_L_3 | SHELL | 1 |
| 5 | wing_joiner | SOLID | 1 |
| 6 | wing_R_0 | SHELL | 1 |
| 7 | wing_R_1 | SHELL | 1 |
| 8 | wing_R_2 | SHELL | 1 |
| 9 | wing_R_3 | SHELL | 1 |
| 10 | main_wing_spar_415mm | | 1 |
| 11 | tip_wing_spar_102mm | | 2 |
| 12 | wing_alignment_spar_25mm | | 1 |
| 13 | nose | SOLID | 1 |
| 14 | fuse_spar_bottom_380mm | | 1 |
| 15 | fuse_spar_top_440mm | | 1 |
| 16 | tail_front | SOLID | 1 |
| 17 | tail_back | SOLID | 1 |
| 18 | tail_spar_front_97mm | | 2 |
| 19 | tail_spar_back_95mm | | 2 |
| 20 | tail_tip_L | SOLID | 1 |
| 21 | tail_tip_R | SOLID | 1 |

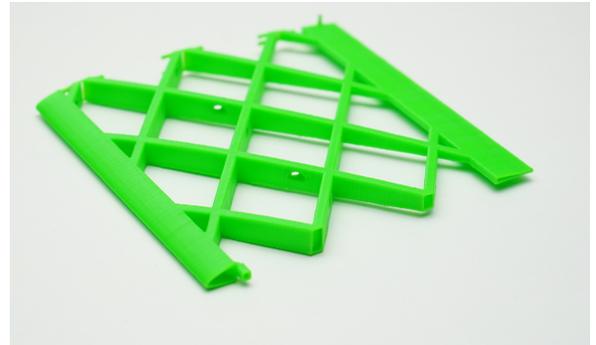
Printing

You need to use two printing methods to print all parts:

1. Solid parts (nose, wing joiner, tail). Use dense (100%) infill. This is common way of printing objects and these parts should be printable on every printer.



2. Shell parts (wings). Use 0% infill and no horizontal surfaces (thickness of the shell is one layer). Only this way you can achieve required weight of the plane.



You can check what method to use on what part in bill of materials table.

Nozzle size: 0.4 mm
Layer thickness: 0.19 mm
Rafts: yes

You can use any material you like, only limitation is high temperature from ironing when covering assembled parts. Heat from the iron can deform the parts. Although I was not able to damage any part and I tried to cover many materials (ABS, PLA ...), please test film covering on your testing part.

One of the goals when designing KRAGA models is to use minimal or no support during printing. Removing support after printing is big pain and you can easily destroy your part. That is the reason why you should use default orientation of all parts during printing.

I strongly recommend to mark every printed part with it's name (I'm using masking tape for that). There are many parts in this plane and from each part there is also mirror side which can easily cause confusion during assembly.

I also recommend to print parts in bulks, especially smaller peaces from tail. Otherwise there is not enough time for material cooling in each layer and you might end up with rough layers, ugly edges or total print fail.

Preparation for assembly

KRAGA Tere plane consists of parts that are printed and parts that you need to buy separately (they are not included in the sold product) – carbon tubes, airgun pellets, covering film or packing tape.

List of required parts:

| | dimensions | count |
|-----------------------------|--------------------|-------|
| carbon tube | Ø 2x1 mm ↔ 1 m | 2 |
| covering film ¹ | ↔ 0.5 m | 1 |
| airgun pellets ² | 0.177 Cal (4.5 mm) | 12 |

Ø 2x1 mm – means tube with outer diameter of 2mm and inner diameter of 1mm

¹ alternative to iron on covering film is packaging tape

² alternative to airgun pellets is using metal screws, fishing weights or whatever small and heavy that fits into ballast holes in the nose of the plane

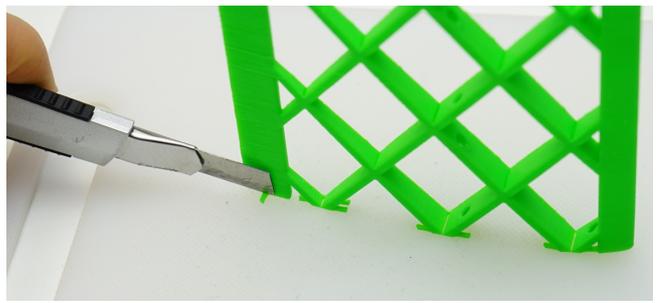
Next step is to cut carbon tubes into smaller pieces, which will be used as spars. Don't forget to mark name on every piece to avoid confusion during the assembly.

| part | dimensions | count |
|---------------------|-------------------|-------|
| main wing spar | ↕ 2x1 mm ↔ 415 mm | 1 |
| tip wing spar | ↕ 2x1 mm ↔ 102 mm | 2 |
| wing alignment spar | ↕ 2x1 mm ↔ 25 mm | 1 |
| fuse spar bottom | ↕ 2x1 mm ↔ 380 mm | 1 |
| fuse spar top | ↕ 2x1 mm ↔ 440 mm | 1 |
| tail spar front | ↕ 2x1 mm ↔ 97 mm | 2 |
| tail spar back | ↕ 2x1 mm ↔ 95 mm | 2 |

TIP: How to cut carbon spars. Wrap masking tape around carbon spar and mark cut position. Use rotary tool or X-ACTO fine saw to cut the spar. Work outside or in room with good ventilation. Use breathing mask to avoid inhaling carbon dust! After cutting wipe out carbon dust from the spars using wet tissue.



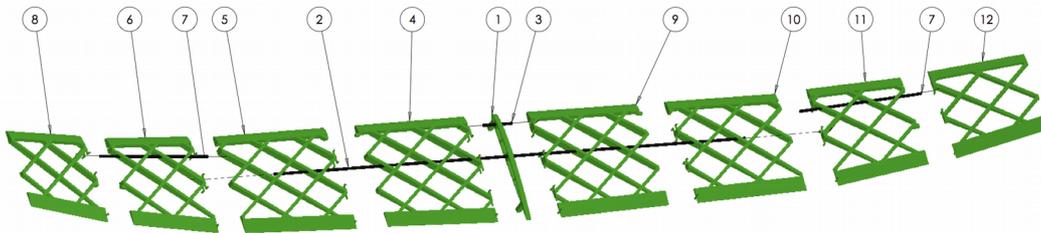
Remove support legs from all parts. Also sand all sharp edges and printing imperfections to avoid covering foil damage.



Assembly

It is recommended to use medium viscosity CA glue. You can use CA glue accelerator for faster curing time. Dry fit all the parts before gluing them together.

Wing



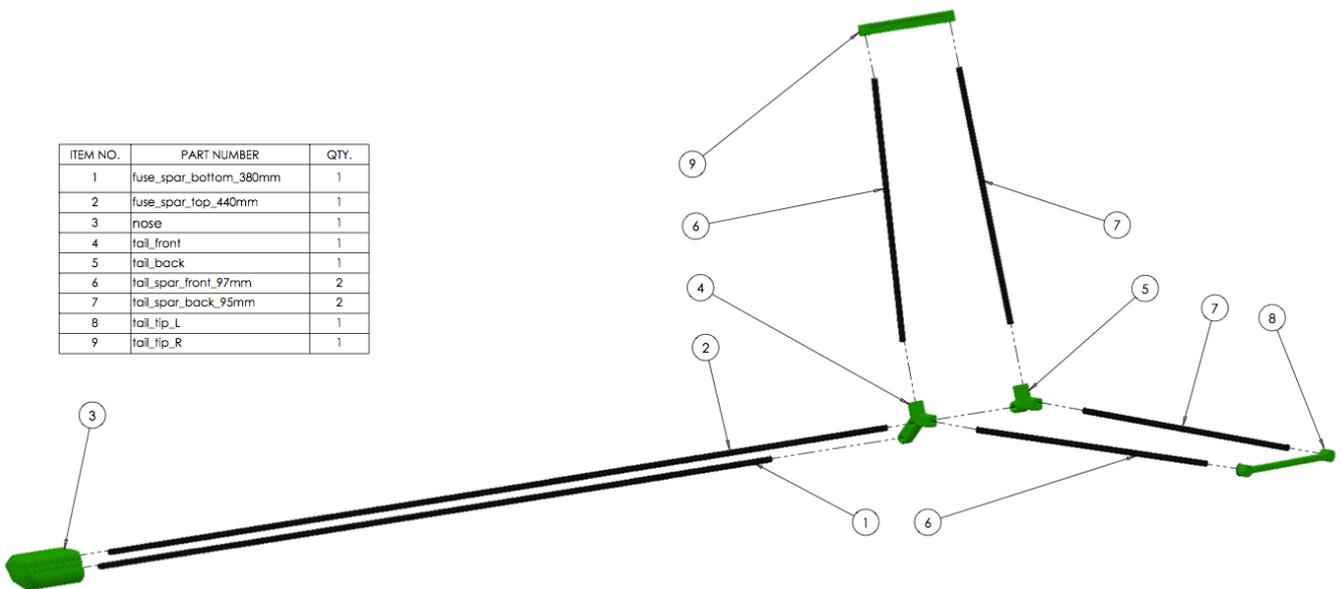
| ITEM NO. | PART NUMBER | QTY. |
|----------|--------------------------|------|
| 1 | wing_joiner | 1 |
| 2 | main_wing_spar_415mm | 1 |
| 3 | wing_alignment_spar_25mm | 1 |
| 4 | wing_L_0 | 1 |
| 5 | wing_L_1 | 1 |
| 6 | wing_L_2 | 1 |
| 7 | tip_wing_spar_102mm | 2 |
| 8 | wing_L_3 | 1 |
| 9 | wing_R_0 | 1 |
| 10 | wing_R_1 | 1 |
| 11 | wing_R_2 | 1 |
| 12 | wing_R_3 | 1 |

Assembly the wing as sketched above. Hold on to the order of the parts as indicated in the picture.

When all the parts are on their position, put glue on contact points where carbon spars are touching printed parts.

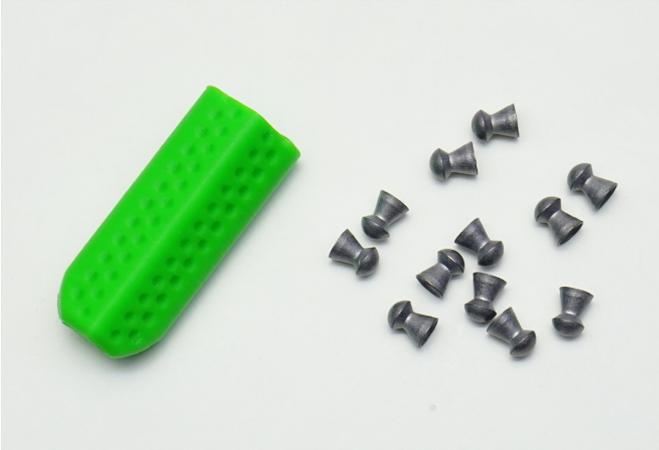
Fuse

| ITEM NO. | PART NUMBER | QTY. |
|----------|------------------------|------|
| 1 | fuse_spar_bottom_380mm | 1 |
| 2 | fuse_spar_top_440mm | 1 |
| 3 | nose | 1 |
| 4 | tail_front | 1 |
| 5 | tail_back | 1 |
| 6 | tail_spar_front_97mm | 2 |
| 7 | tail_spar_back_95mm | 2 |
| 8 | tail_tip_L | 1 |
| 9 | tail_tip_R | 1 |



When assembling the fuselage start with the nose and both fuse spars, but **do not glue it yet**. Nose helps to align the spars during assembly and has to be removable so that during final assembly the wing can be slide on to the fuse spars. Build the rest of the fuselage as sketched above.

Nose ballast



Remove the nose from the fuselage. Insert 12 airgun pellets (177 Cal) into it and secure the pellets in place with the glue.

You can use other kind of ballast (metal screws, fishing weights...). Nose including the ballast should weight 10 grams (0.35 oz).

Covering

There are two options you can choose from. You can cover the plane using shrinkable covering foil or use ordinary packaging tape.

Film covering

Covering of 3D printed planes is done the same way as you would do with common balsa RC plane. It is important to test film covering on testing part before you start.

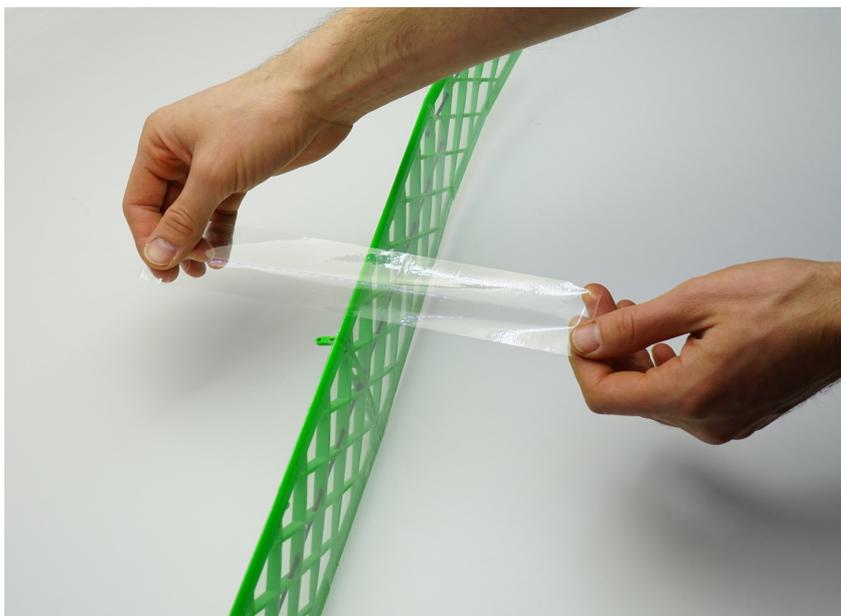


If you have no experience with film covering my advice is to try more brands of covering film before you get frustrated. It is easier to work with some than with other. I tested couple of brands and in my opinion *solarfilm lite* is the best option for this kind of plane.

Tape covering

This is a simple alternative for those who don't want to get into iron on covering. The disadvantage of this method is increased weight of the plane and not perfectly stretched surface.

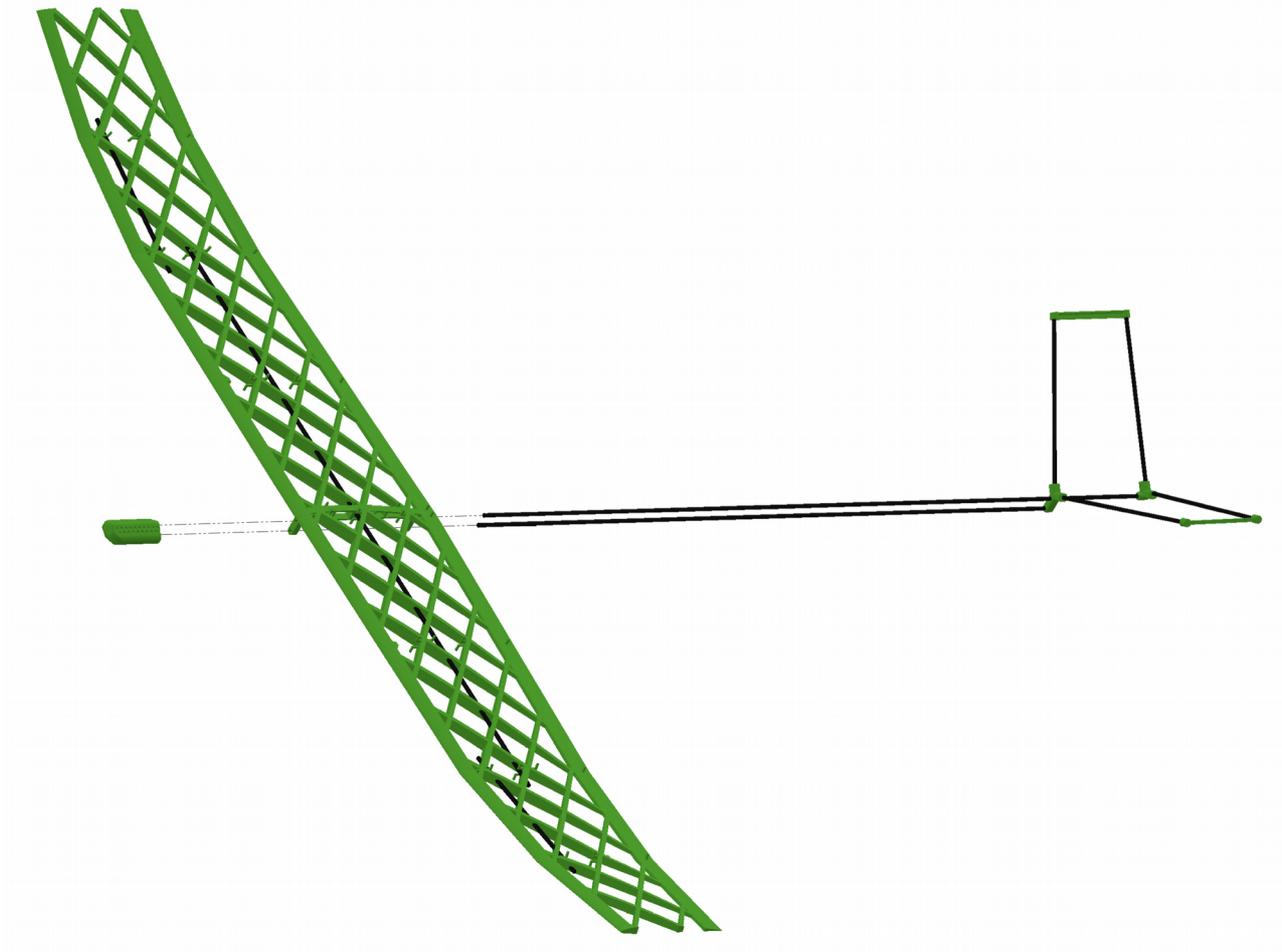
Use many tape peaces and stick them perpendicular to wing leading edge starting from the middle of the wing. Each tape peace should be 2 times longer than wing chord and will cover both top and bottom side of the wing.



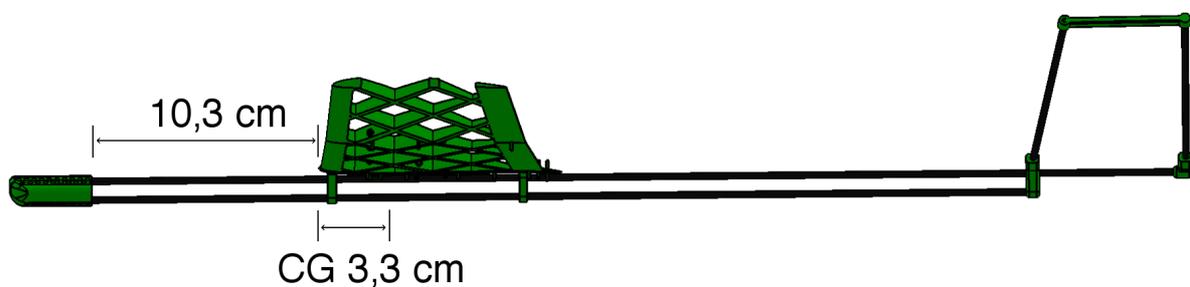
When covering the tail use the same method as for the wing.

Covering of the tail has to be perfectly tight and stretched. Tail is the control surface of the plane and if it's not tight then the plane flies in random directions.

Final assembly



Slide the wing onto the fuse spars. Then insert the nose back onto the fuse spars and secure it with the glue. Leading edge of the wing should be 10,3 cm from the end of the nose.
Check the position of center of gravity, it should be 3,3 cm from wing leading edge. Fix the position of the wing with the glue.



Settings and flying

CG

31 mm – 34 mm from wing leading edge measured next to the wing root.

Setting your CG exactly is very important!

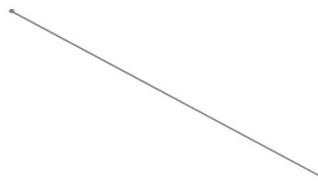
Flying

Before first flight check that CG is set correctly, all joints are glued strongly, fuselage spars are straight and covering on the tail is perfectly stretched. The less wind the better. Always throw the plane against the wind.

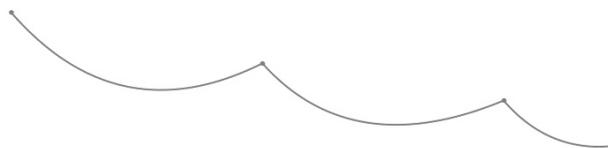
- Ideal CG:
enjoy



- Front heavy:
take some weight
away from the
nose or move the
wing closer to the
nose



- Back heavy:
add more weight
to the nose or
move the wing
further back from
the nose



If the plane behaves randomly, the cause might be loose joints or tail covering is not stretched enough. Check if all fuselage spars are glued properly to the wing joiner, nose and tail.

Rough landings especially in cold weather can cause glue joints to fail. Mostly the ones on the tail and wing joiner.

Happy flying

Tomas