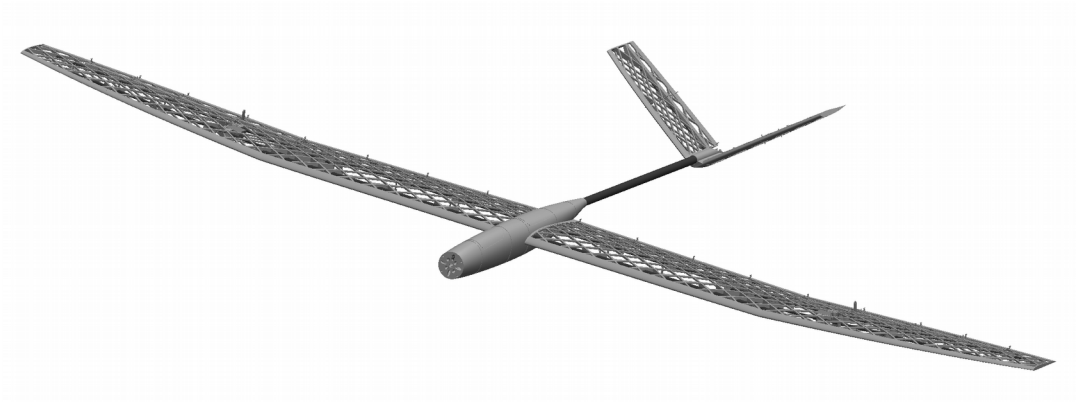
KRAGA

Kodo II build guide 1.0



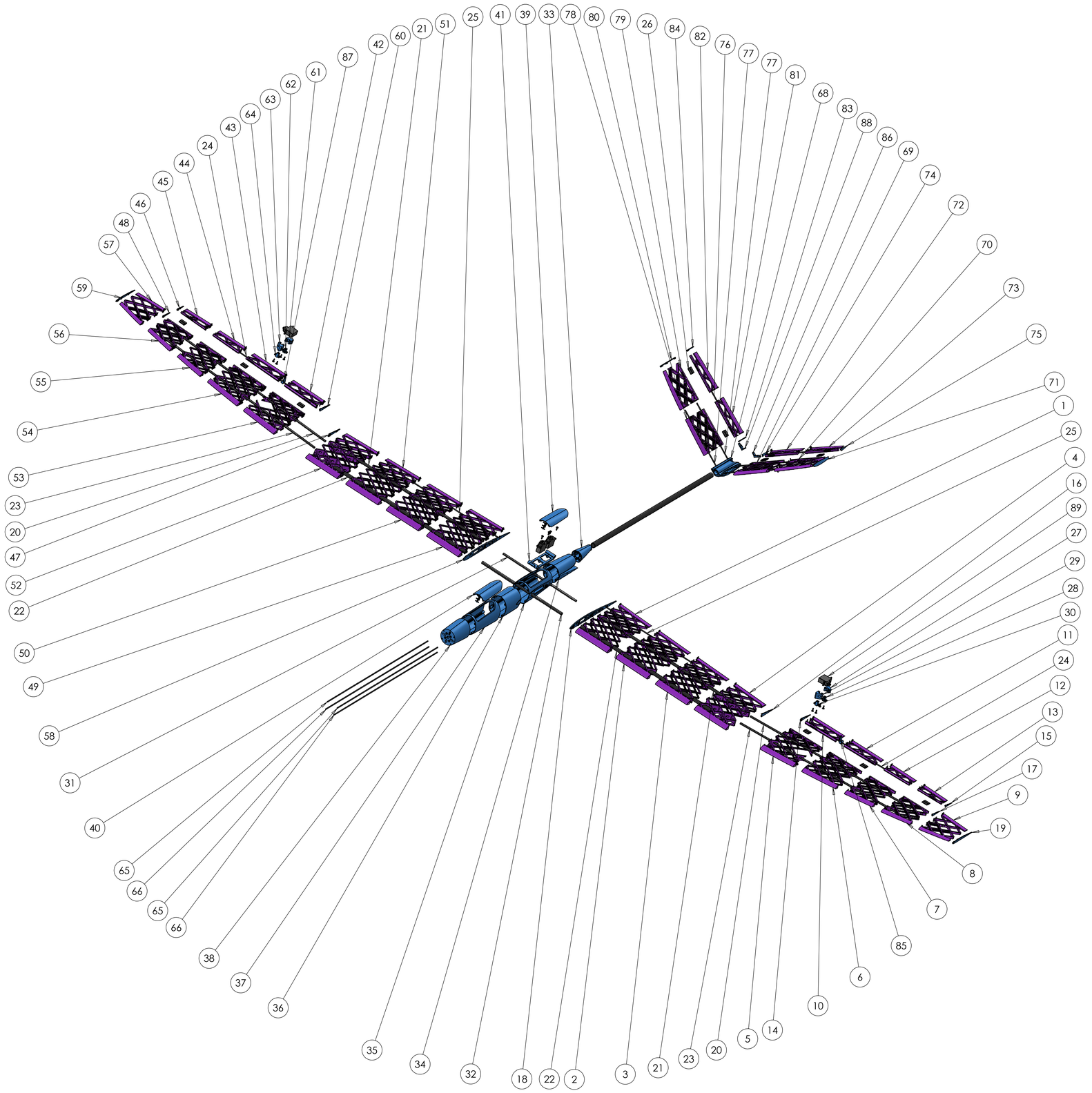
Please do not share files that you bought

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.

support@kragamodels.com

KRAGA Kodo II

ITEM NO.	PART NUMBER	PRINTED 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_L_4	shell	1
6	wing_L_5	shell	1
7	wing_L_6	shell	1
8	wing_L_7	shell	1
9	wing_L_8	shell	1
10	ail_L_0	shell	1
11	ail_L_1	shell	1
12	ail_L_2	shell	1
13	ail_L_3	shell	1
14	ail_root_endcap_L	solid	1
15	ail_tip_endcap_L	solid	1
16	wing_ail_innercap_root_L	solid	1
17	wing_ail_innercap_tip_L	solid	1
18	wing_root_endcap_L	solid	1
19	wing_tip_endcap_L	solid	1
20	4x3_474	-	2
21	6x4_402	-	2
22	8x6_402	-	2
23	4x3_459	-	2
24	2x1_298	-	2
25	2x1_317	-	2
26	hinge	-	10
27	ail_servo_mount_L_B	solid	1
28	ail_servo_mount_L_B_glue_on	solid	1
29	ail_servo_mount_L_F	solid	1
30	ail_servo_mount_L_F_glue_on	solid	1
31	4x3_220	-	1
32	6x4_240	-	1
33	fuse_0	solid	1
34	fuse_1	solid	1
35	fuse_2	solid	1
36	fuse_3	solid	1
37	fuse_4	solid	1
38	fuse_5_SK3_2836	solid	1
39	canopy_back	solid	1
40	canopy_front	solid	1
41	servo_plate	solid	1
42	ail_R_0	shell	1
43	ail_R_1	shell	1
44	ail_R_2	shell	1
45	ail_R_3	shell	1

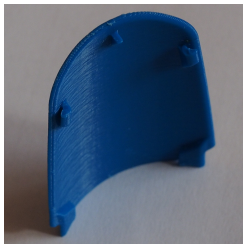


ITEM NO.	PART NUMBER	PRINTED AS	QTY.
46	ail_tip_endcap_R	solid	1
47	wing_ail_innercap_root_R	solid	1
48	wing_ail_innercap_tip_R	solid	1
49	wing_R_0	shell	1
50	wing_R_1	shell	1
51	wing_R_2	shell	1
52	wing_R_3	shell	1
53	wing_R_4	shell	1
54	wing_R_5	shell	1
55	wing_R_6	shell	1
56	wing_R_7	shell	1
57	wing_R_8	shell	1
58	wing_root_endcap_R	solid	1
59	wing_tip_endcap_R	solid	1
60	ail_root_endcap_R	solid	1
61	ail_servo_mount_R_B	solid	1
62	ail_servo_mount_R_B_glue_on	solid	1
63	ail_servo_mount_R_F	solid	1
64	ail_servo_mount_R_F_glue_on	solid	1
65	2x1_423	-	2
66	2x1_435	-	2
67	12x10_500	-	1
68	tail_boom_mount	solid	1
69	tail_main_L_0	shell	1
70	tail_main_L_1	shell	1
71	tail_main_tip_endcap_L	solid	1
72	tail_mov_L_0	shell	1
73	tail_mov_L_1	shell	1
74	tail_mov_root_endcap_L	solid	1
75	tail_mov_tip_endcap_L	solid	1
76	2x1_123	-	2
77	2x1_163	-	4
78	tail_main_R_0	shell	1
79	tail_main_R_1	shell	1
80	tail_main_tip_endcap_R	solid	1
81	tail_mov_R_0	shell	1
82	tail_mov_R_1	shell	1
83	tail_mov_root_endcap_R	solid	1
84	tail_mov_tip_endcap_R	solid	1
85	ail_horn_L	solid	1
86	tail_horn_L	solid	1
87	ail_horn_R	solid	1
88	tail_horn_R	solid	1
89	servo_common	-	4
90	screw_M2x8mm	-	12

Printing

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

1. Solid parts (fuse and accessories). Use dense 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.

Other recommended printing settings:

- 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 was 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. There are only a few parts from whole plane which require support, the rest of the plane should be support-free.

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 parts like ailerons or moving section on the plane tail. Otherwise there is not enough time for material cooling in each layer and you might end up with rough layers, ugly edges or print fail.

Parts options

For some parts there are more options and it is up to you what you will choose depending on your preferences. All options can be found in Options directory.

Options based on wing – with or without flap:

- for ailerons only wing use wing parts from the main directory
- for wing with both ailerons and flaps replace wing_L_0.STL, wing_L_1.STL, wing_L_2.STL, wing_L_3.STL with wing_L_wf_0.STL, wing_L_wf_1.STL, wing_L_wf_2.STL, wing_L_wf_3.STL from Options directory (the same with parts for right half of the wing having R in the file name).

Options based on used motor:

- when using the recommended Turnigy Aerodrive SK3 - 2836 brushless outrunner motor, print fuse_5_sk3_2836 located in main directory
- other motor: print fuse_5_uni located in Options direcotry, for this option you need to drill motor screw holes manually

Options based on fuselage:

- for motorized glider use wing parts from the main directory
- for pure glider replace fuse_0.STL..fuse_5.STL with fuse_glider_0.STL.. fuse_glider_5.STL from Options directory.

Preparation for assembly

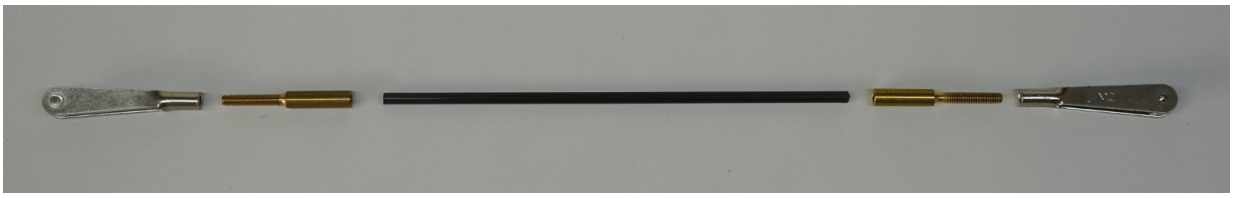
KRAGA Kodo II plane consists of parts that are printed and parts that you need to buy separately (they are not included in sold product) – carbon tubes and pinned hinges.

List of required parts:

	dimensions	count
carbon tube	⌀ 2x1 mm ↔ 1 m	5
carbon tube	⌀ 4x3 mm ↔ 1 m	3
carbon tube	⌀ 6x4 mm ↔ 1m	2
carbon tube	⌀ 8x6 mm ↔ 1m	1
carbon tube	⌀ 12x10 mm ↔ 500 mm	1
covering film	↔ 2 m	1
pinned hinge	↕ ↔ 16x28x1.2mm	10*
folding propeller	up to ↔ 10 inch (I use 9x7)	1
spinner	⌀ 40 mm	1
screw	M2 ↔ 8mm	10

⌀ 2x1 mm – means tube with outer diameter of 2mm and inner diameter of 1mm
* wing with flaps requires 6 additional hinges

And of course you need all the common accessories like clevises, push rods (horns are printed so you don't need those) and servo extension cables (2 pieces of 20 cm cable for aileron servos). One way how to make custom pushrods is using 2x1 mm carbon tube glued into threaded couplers and screwed into metal clevises. If you will use custom made pushrods, add 2 pieces of ⌀ 2x1 mm ↔ 1 m carbon tube to your shopping list.

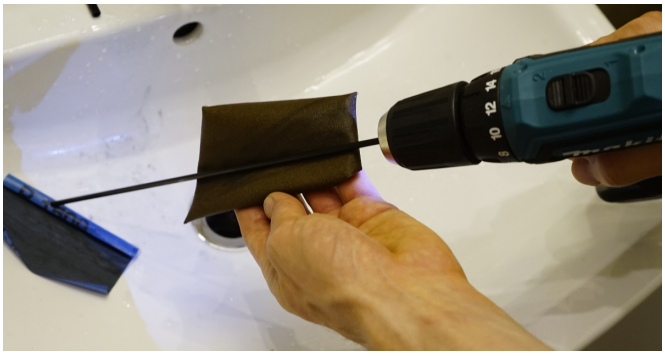


Next step is to cut carbon tubes and rods into smaller pieces, which will be used as spars, joiners or boom of the plane. Don't forget to mark every piece to avoid confusion during the assembly.

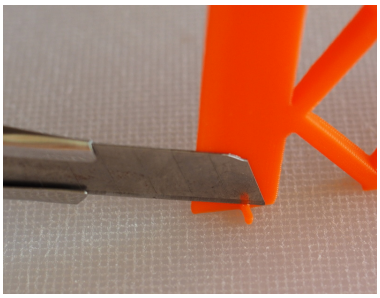
Carbon spars		
part	dimensions	count
Wing:		
Aileron carbon spar	⌀ 2x1 mm ↔ 298 mm	2
Wing alignment carbon spar	⌀ 2x1 mm ↔ 317 mm (no flaps wing only)	2
Flap carbon spar	⌀ 2x1 mm ↔ 371 mm (wing with flaps only)	2
Wing tip front carbon spar	⌀ 4x3 mm ↔ 459 mm	2
Wing tip back carbon spar	⌀ 4x3 mm ↔ 474 mm	2
Main wing front carbon spar	⌀ 6x4 mm ↔ 402 mm	2
Main wing back carbon spar	⌀ 8x6 mm ↔ 402 mm	2
Fuselage:		
Fuse top carbon spar	⌀ 2x1 mm ↔ 423 mm (motorized fuselage only)	2
Fuse bottom carbon spar	⌀ 2x1 mm ↔ 435 mm (motorized fuselage only)	2
Glider fuse top carbon spar	⌀ 2x1 mm ↔ 417 mm (glider fuselage only)	2
Glider fuse bottom carbon spar	⌀ 2x1 mm ↔ 439 mm (glider fuselage only)	2
Glider servo plate carbon spar front	⌀ 2x1 mm ↔ 29 mm (glider fuselage only)	1
Glider servo plate carbon spar back	⌀ 2x1 mm ↔ 31 mm (glider fuselage only)	1
Carbon boom	⌀ 12x10 mm ↔ 500 mm (optionally 12x11)	1
Wing joiner carbon tube front	⌀ 6x4 mm ↔ 240 mm (motorized fuselage only)	1
Wing joiner carbon tube back	⌀ 4x3 mm ↔ 220 mm (motorized fuselage only)	1
Wing joiner carbon tube front	⌀ 6x4 mm ↔ 220 mm (glider fuselage only)	1
Wing joiner carbon tube back	⌀ 4x3 mm ↔ 200 mm (glider fuselage only)	1
Tail:		
Tail main carbon spar	⌀ 2x1 mm ↔ 163 mm	4
Tail mov carbon spar	⌀ 2x1 mm ↔ 123 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.

TIP: Carbon wing joiner tubes on the fuselage should fit into spars in the wing. Sometimes the fit is too tight or you cannot insert joiner tubes into wing spars at all. You can use drill and wet sandpaper to make joiner tubes thinner. Use breathing mask to avoid inhaling carbon dust!



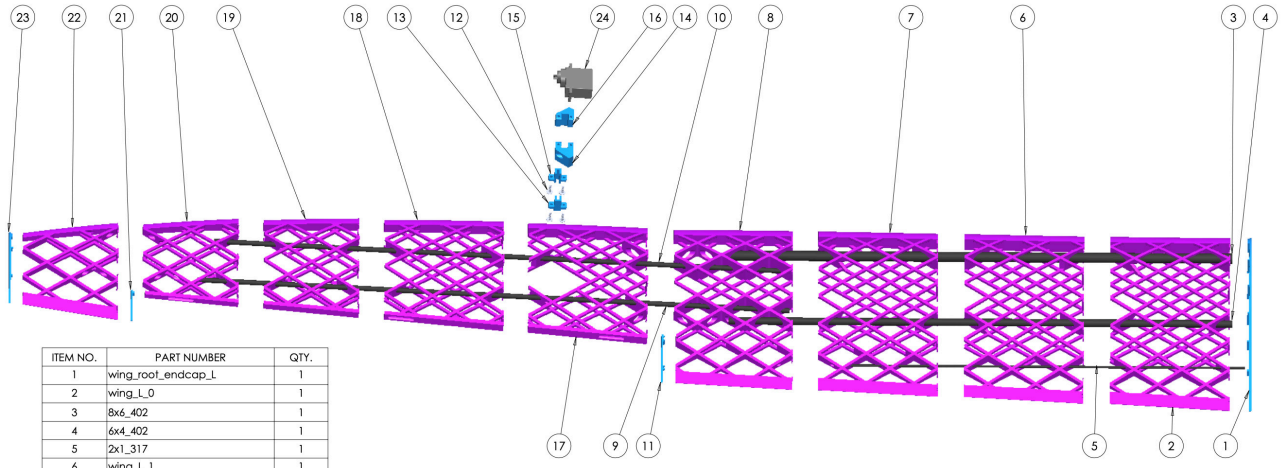
Remove support legs from all parts. Also sand all sharp edges and printing imperfections to avoid covering foil damage.



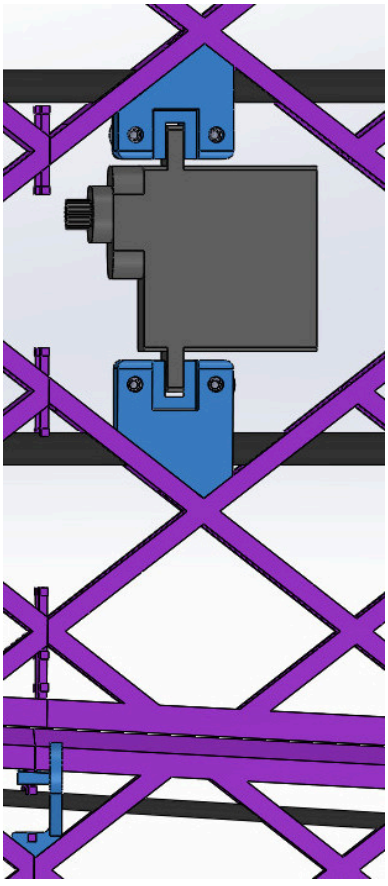
Assembly

This assembly will describe always left side of the plane when it comes to symmetric parts. I 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 parts in assembly drawings have printing support legs visible, please ignore it, these legs should be removed before plane assembly.

Wing (without flap option)



ITEM NO.	PART NUMBER	QTY.
1	wing_root_endcap_L	1
2	wing_L_0	1
3	8x6_402	1
4	6x4_402	1
5	2x1_317	1
6	wing_L_1	1
7	wing_L_2	1
8	wing_L_3	1
9	4x3_474	1
10	4x3_459	1
11	wing_ail_innercap_root_L	1
12	screw_M2x8mm	4
13	ail_servo_mount_L_B_glue_on	1
14	ail_servo_mount_L_B	1
15	ail_servo_mount_L_F_glue_on	1
16	ail_servo_mount_L_F	1
17	wing_L_4	1
18	wing_L_5	1
19	wing_L_6	1
20	wing_L_7	1
21	wing_ail_innercap_tip_L	1
22	wing_L_8	1
23	wing_tip_endcap_L	1
24	servo_common	1



Assembly left wing as sketched above. Main carbon spars (8x6_402 and 6x4_402) should be aligned flush with base of wing_root_endcap_L part. Wing alignment carbon spar (2x1_317) shold protrude 1 cm from wing_root_endcap_L part. When all the parts are in their position, put glue on contact points where carbon spars are touching printed parts.

When assembling aileron servo mounts, you have an option to either glue ail_servo_mount_L_F_glue_on to ail_servo_mount_L_F and ail_servo_mount_L_B_glue_on to ail_servo_mount_L_B or to use screws as an attachment method. Using screws allows you to remove the servo later in case of servo replacement or service.

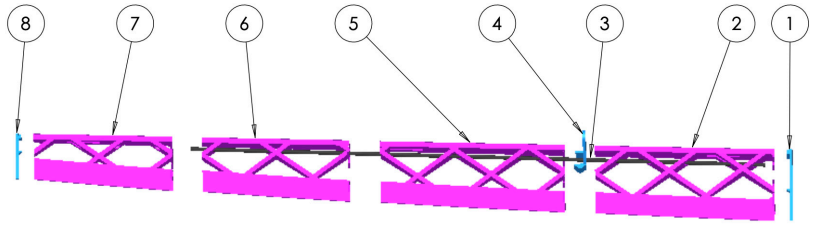
If you decided to use glue/permanent attachment method, do not

forget to center your servos before gluing them in. Check also that servo arm holes fit your clevises and enlarge the holes if necessary, drilling them when servo is in place could damage the wing.

If you decided to use screws as shown on the picture with servo detail, notice that screws are screwed in from bottom side of the wing. It is strongly recommended to pre-drill the screw holes.

In both cases servo has to be glued to ail_servo_mount_L_F_glue_on and ail_servo_mount_L_B_glue_on parts.

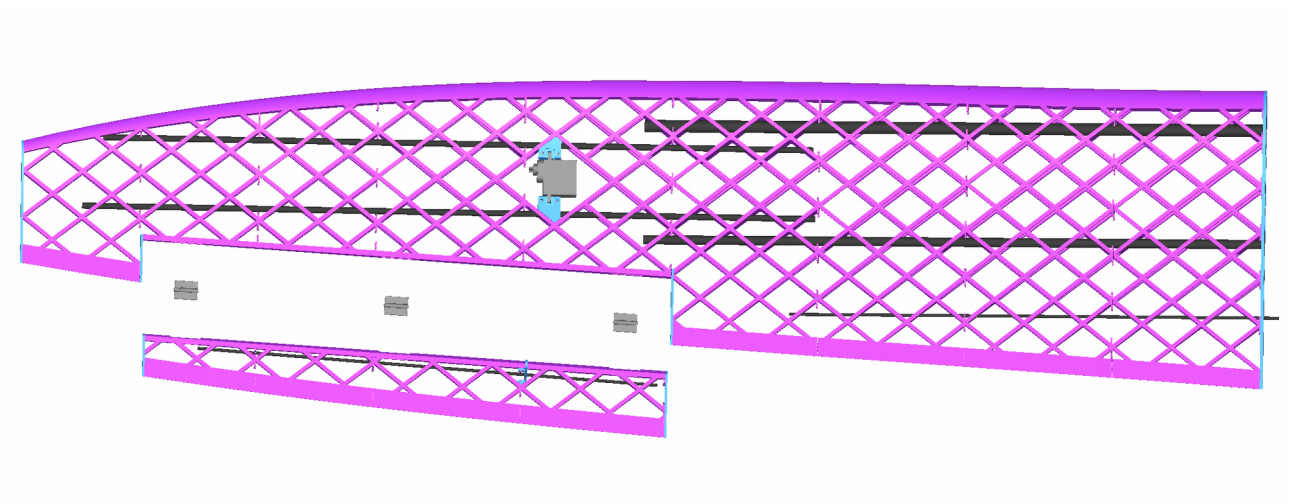
Aileron



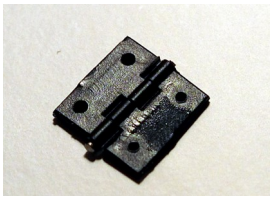
ITEM NO.	PART NUMBER	QTY.
1	ail_root_endcap_L	1
2	ail_L_0	1
3	2x1_298	1
4	ail_horn_L	1
5	ail_L_1	1
6	ail_L_2	1
7	ail_L_3	1
8	ail_tip_endcap_L	1

Assembly left aileron as sketched above. Notice, that carbon spar does not protrude out from the aileron. Don't forget to insert ail_horn_L part between ail_L_0 and ail_L_1. Aileron horn should stick out from the top side of the wing. When all the parts are in their position, put glue on contact points where carbon spars are touching printed parts. Put also a bit of glue on trailing edge where all the aileron sections are touching each other.

Aileron to wing



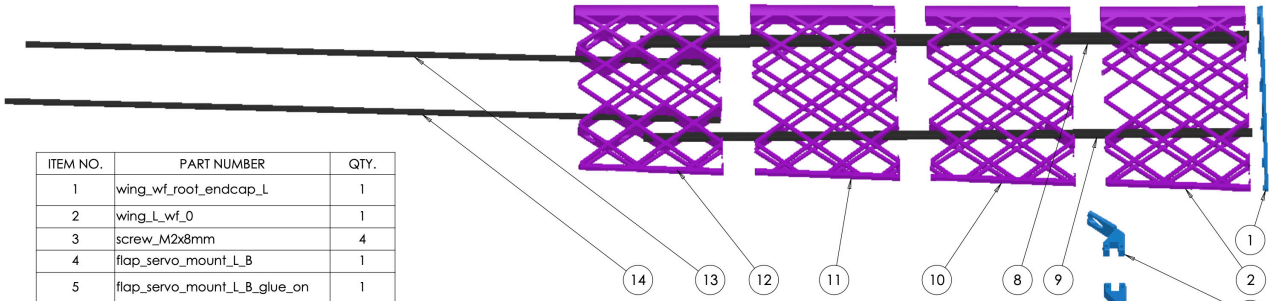
To complete wing assembly attach aileron to the wing.



Hinge slots are not deep enough to fit whole hinge length. Shorten all hinges as shown on the picture. It has no benefit in terms of added stiffness of rigidity to use whole hinge arm length as only small hinge area is in contact with the wing.

Be very careful when using glue near pinned part of the hinge. First insert the hinge into hinge hole and then apply the glue from inner side of the wing. Do the same when gluing aileron to hinge. First insert all hinges into hinge holes on aileron and then apply glue from inner side of aileron. Make sure that aileron has enough space for moving from every side.

Wing (with flap option)



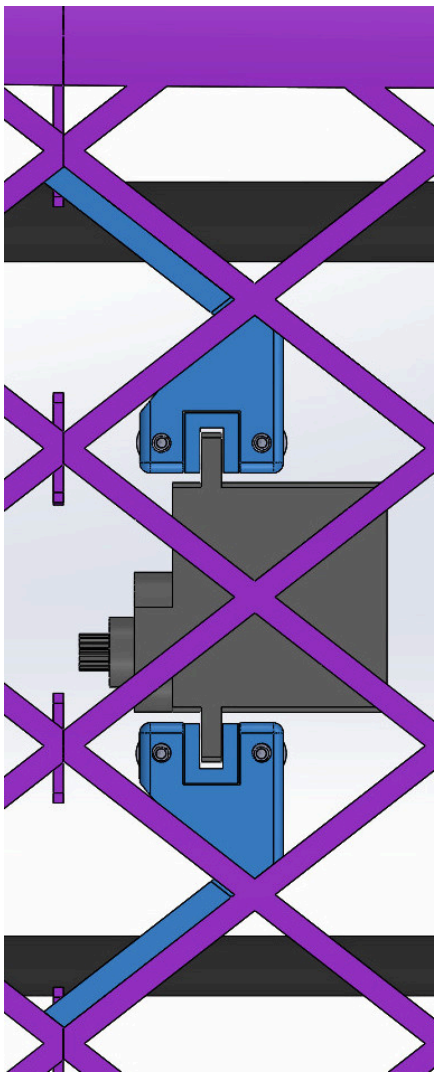
ITEM NO.	PART NUMBER	QTY.
1	wing_wf_root_endcap_L	1
2	wing_L_wf_0	1
3	screw_M2x8mm	4
4	flap_servo_mount_L_B	1
5	flap_servo_mount_L_B_glue_on	1
6	flap_servo_mount_L_F	1
7	flap_servo_mount_L_F_glue_on	1
8	8x6_402	1
9	6x4_402	1
10	wing_L_wf_1	1
11	wing_L_wf_2	1
12	wing_L_wf_3	1
13	4x3_459	1
14	4x3_474	1
15	servo_common	1

Wing with flaps has the same parts as the aileron only wing, except for the first 4 sections and wing alignment spar. That is why the drawing shows only half of the wing, the rest should be assembled exactly same as already described above in *Wing (without flap option)* section starting with aileron servo mount and wing_L_4. Main carbon spars (8x6_402 and 6x4_402) should be aligned flush with base of wing_wf_root_endcap_L part.

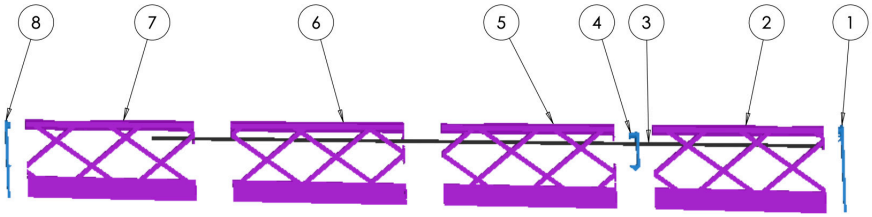
Same as with aileron servo mount, you have an option to either glue flap_servo_mount_L_F_glue_on to flap_servo_mount_L_F and flap_servo_mount_L_B_glue_on to flap_servo_mount_L_B or to use screws as an attachment method.

Picture on the side shows top detail view of flap servo mount. Screws are screwed in from the bottom side of the wing. It is strongly recommended to pre-drill the screw holes.

If you decided to use glue/permanent attachment method, do not forget to center your servos before gluing them in. Check also that servo arm holes fit your clevises and enlarge the holes if necessary, drilling them when servo is in place could damage the wing.



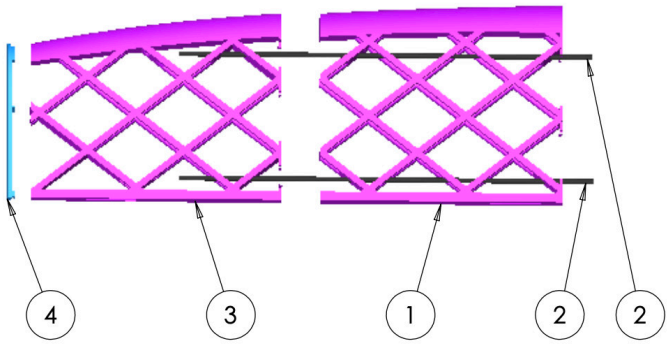
Flap (with flap option)



ITEM NO.	PART NUMBER	QTY.
1	flap_root_endcap_L	1
2	flap_L_0	1
3	2x1_371	1
4	flap_horn_L	1
5	flap_L_1	1
6	flap_L_2	1
7	flap_L_3	1
8	flap_tip_endcap_L	1

Assembly left flap as sketched above. Notice, that carbon spar does not protrude out from the flap. Don't forget to insert flap_horn_L part between flap_L_0 and flap_L_1. Flap horn should stick out from the bottom side of the wing. When all the parts are in their position, put glue on contact points where carbon spars are touching printed parts. Put also a bit of glue on trailing edge where all the flap sections are touching each other.

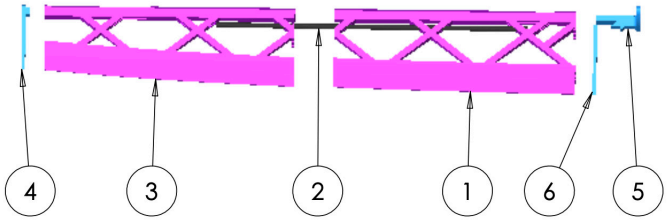
Tail main



ITEM NO.	PART NUMBER	QTY.
1	tail_main_L_0	1
2	2x1_163	2
3	tail_main_L_1	1
4	tail_main_tip_endcap_L	1

Assembly left main tail as sketched above. Tail wing uses inverted airfoil. Carbon spars should protrude 12 mm from base of tail_main_L_0. When all the parts are in their position, put glue on contact points where carbon spars are touching printed parts.

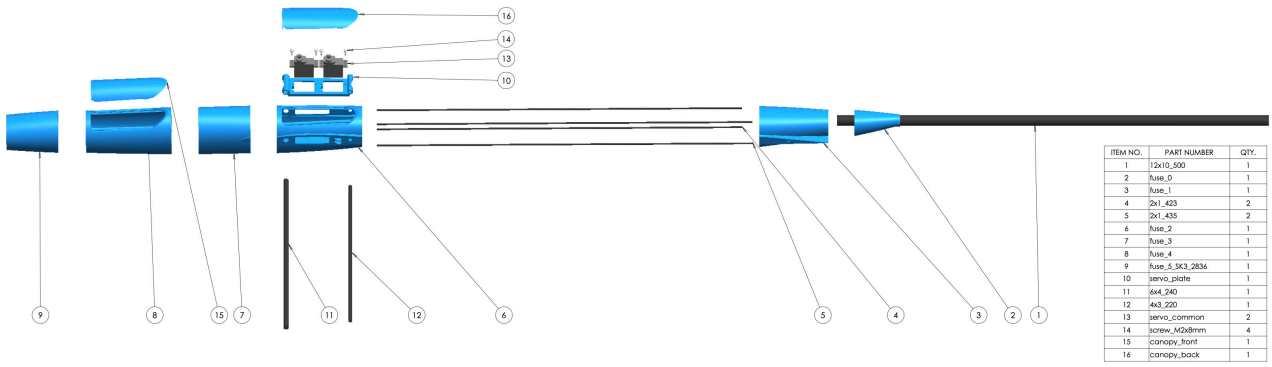
Tail mov



ITEM NO.	PART NUMBER	QTY.
1	tail_mov_L_0	1
2	2x1_123	1
3	tail_mov_L_1	1
4	tail_mov_tip_endcap_L	1
5	tail_horn_L	1
6	tail_mov_root_endcap_L	1

Assembly moving part of left tail as sketched above. Carbon spar should be centered in the middle. When all the parts are in their position, put glue on contact points where carbon spars are touching printed parts.

Fuselage (motorized option)



ITEM NO.	PART NUMBER	QTY.
1	12x10_500	1
2	fuse_0	1
3	fuse_1	1
4	2x1_423	2
5	2x1_435	2
6	fuse_2	1
7	fuse_3	1
8	fuse_4	1
9	fuse_5_SK3_2836	1
10	servo_plate	1
11	6x4_240	1
12	4x3_220	1
13	servo_common	2
14	screw_M2x8mm	4
15	canopy_front	1
16	canopy_back	1

Start by gluing together boom and fuse_0. Boom should protrude 2cm from the fuse_0 part. When these two parts are aligned correctly apply glue from the tail side of the wing. fuse_0 part has tiny channels for glue to soak in along the boom.

Second step is to attach fuse_1 part to the protruding boom. Make sure that all 4 fuse spar leading holes are aligned correctly and secure it to the carbon boom with glue.

Then insert 2 pieces of 2x1_423 into top fuse spar channels of fuse_1 all the way in up to fuse_0 and 2 pieces of 2x1_435 into bottom spar channels of fuse_1 all the way in up to fuse_0. Apply the glue from inner side of fuse_1 everywhere, where fuse spars are visible from the inside of the fuselage. Let the glue leak further into places which are hard to reach.

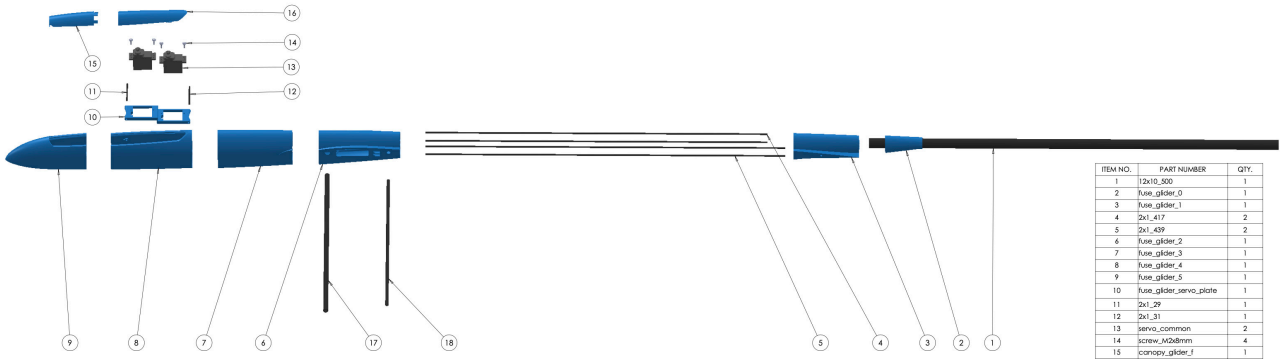
It can happen that spar leading holes are too tight and it is difficult to insert carbon spars into them. One option is to use ordinary bicycle steel spoke (2mm thick). Cut the head and the thread off, make some kind of sharp edge and mount it into a drill. This way you can drill through all spar leading holes to remove all printing imperfections. Another option is to use metal cable which you can straighten and use in the drill.

Continue with rest of fuselage parts. Always put each part in its position and only then apply the glue from inner side.

Make sure, that wing joiner carbon tubes (6x4_240 and 4x3_220) fit into main wing spars, if not, use drill and wet sanding paper as described in the beginning of this guide to make them thinner.

When all fuse parts (fuse_0 ... fuse_5) are glued together, pre-drill screw holes on servo plate and insert it into fuse_2. Lead both wing joiner tubes through holes in fuse_2 and holes in servo plate. Center wing joiner tubes so, that the same length protrudes out from each side of the fuselage. Apply the glue from inside of the fuselage to secure servo plate and joiner tubes in place.

Fuselage (glider option)



ITEM NO.	PART NUMBER	QTY.
1	12x10_500	1
2	fuse_glider_0	1
3	fuse_glider_1	1
4	2x1_417	2
5	2x1_439	2
6	fuse_glider_2	1
7	fuse_glider_3	1
8	fuse_glider_4	1
9	fuse_glider_5	1
10	fuse_glider_servo_plate	1
11	2x1_29	1
12	2x1_31	1
13	servo_common	2
14	screw_M2x8mm	4
15	canopy_glider_f	1
16	canopy_glider_b	1
17	6x4_240	1
18	4x3_220	1

Start by gluing together boom and fuse_glider_0. Boom should protrude 2 cm from the fuse_glider_0 part. When these two parts are aligned correctly apply glue from the tail side of the wing. fuse_glider_0 part has tiny channels for glue to soak in along the boom.

Second step is to attach fuse_glider_1 part to the protruding boom. Make sure that all 4 fuse spar leading holes are aligned correctly and secure it to the carbon boom with glue.

Then insert 2 pieces of 2x1_417 into top fuse spar channels of fuse_glider_1 all the way in and 2 pieces of 2x1_439 into bottom spar channels of fuse_glider_1 all the way in up to fuse_glider_0. Apply the glue from inner side of fuse_glider_1 everywhere, where fuse spars are visible from the inside of the fuselage. Let the glue leak further into places which are hard to reach.

Continue with rest of fuselage parts. Always put each part in its position and only then apply the glue from inner side.

When all fuse parts (fuse_glider_0 ... fuse_glider_5) are glued together, pre-drill screw holes on servo plate and insert it into fuse_glider_4. Lead servo plate holder carbon tubes (2x1_29 and 2x1_31) from right side of the fuselage through holes in the fuselage and holes in servo_plate all the way in. Apply the glue from inside of the fuselage to secure servo plate holder tubes in place. I recommend to glue in servo plate only after servos are installed and pushrods are correctly centered in fuselage.

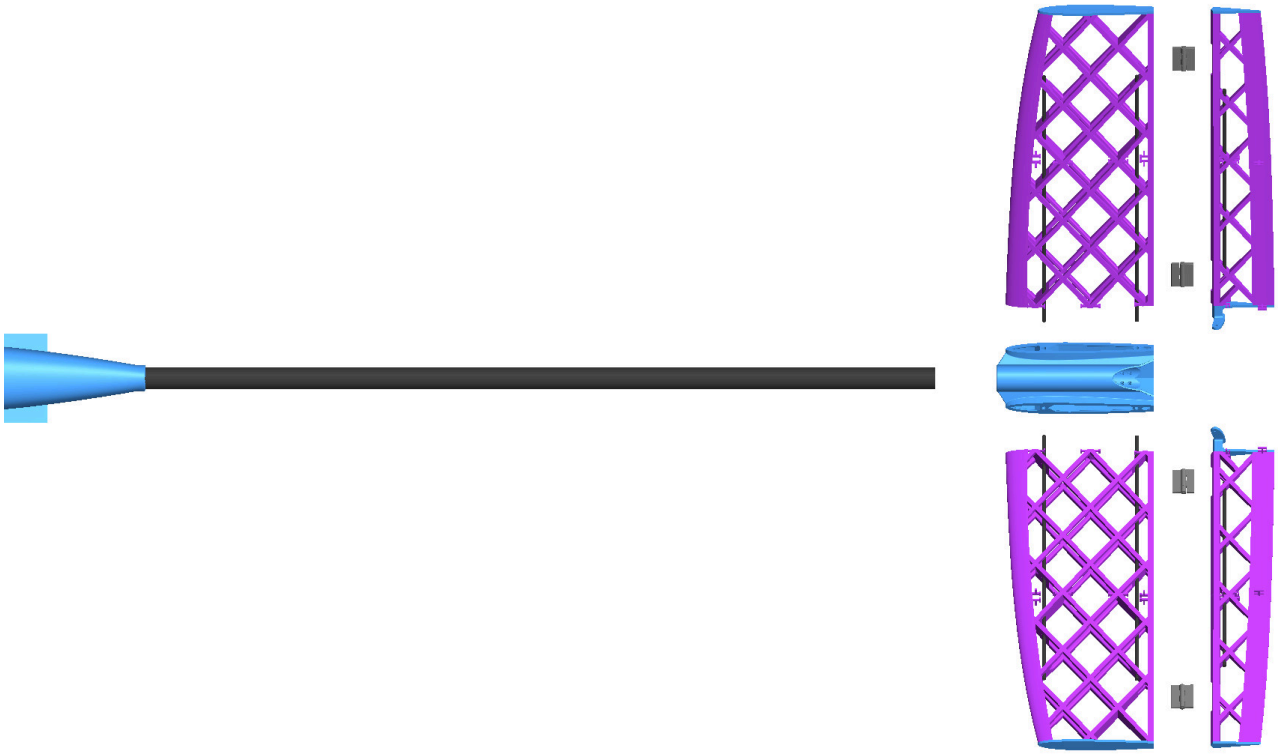
Glue together canopy halves.

Make sure, that wing joiner carbon tubes (6x4_220 and 4x3_200) fit into main wing spars, if not, use drill and wet sanding paper as described in the beginning of this guide to make them thinner.

Lead both wing joiner tubes through holes in fuse_glider_2. Center wing joiner tubes so, that the same length protrudes out from each side of the fuselage. Apply the glue from inside of the fuselage to secure servo plate and joiner tubes in place.

Glider fuselage is prepared for optional tow hook installation. On the bottom side is small indent which is aligned with reinforcement structure inside of the fuselage and where you can pre-drill a hole for the hook.

Tail



To complete tail assembly first shorten all hinges and then insert the hinges into hinge slots and apply the glue from inner side of the main tail. Then insert all hinges into hinge slots on moving part of the tail and put the glue from inner side of the moving part. Tip of the moving part should be aligned flush with main part.

Before gluing tail surfaces to tail_boom_mount, dry fit protruding spars of the tail surfaces into tail_boom_mount. Apply the glue on the protruding spars and insert them into tail_boom_mount.

Insert boom into tail_boom_mount. Aline the tail correctly with rest of the fuselage (use joiner rods as helping guide). Then you can put the glue from the front side of tail_boom_mount. It has tiny channels for glue to soak in along the boom.

Covering

It is important to test film covering on testing part before you start. Covering of 3D printed parts is a bit special because of thermal expansion of plastics. When heating up the plastics it expands a bit. Covering is then actually done on slightly enlarged wing and when the wing is cooling down it shrinks back. But the covering foil does not and that causes wrinkles.

That is why some covering materials work better than other. Some are very stretchy and have the capacity to shrink down even more together with the printed wing as it is cooling down and shrinking and some do not.

I tested couple of brands and in my opinion Solarfilm Lite is the best option for 3D printed planes from Kraga. Unfortunately the company Solarfilm stopped production, so this material is very hard to get. Other good options (which I did not test myself) should be AeroLITE rolls and Coverite 21st Century Microlite.

If you cannot get one of the above mentioned covering materials, then in general lightweight options of covering materials work the best. For example Oralight from Oracover or UltraCote lite.

I strongly advice everybody to use trimming iron instead of standard sized one, because with trimming iron you don't heat up the wing that much.

Another very useful tool is covering film adhesive for example Cover grip from Deluxe materials. When using covering adhesive the foil sticks better and one doesn't have to heat it up that much, what again prevents expansion of the wing.

Finally the technique is also important, but that comes with practice. Covering video guide can be found in how to section on KRAGA web page: *https://3dprintedrcplanes.com/how_to/*

My recommendation is to cover wings after they are fully assembled (center wing, tip wing and aileron are glued together). It is a little bit more demanding but it is definitely worth it. Otherwise you are risking, that when gluing aileron to hinges and hinges to wing tip, glue might leak and spread all over hinge pin which will block the hinge and aileron would get stuck.

The same is valid for tail covering. Cover it after you glued on the moving part with hinges.

Electronics

This is by no means the best way possible how to setup your plane. It is just a brief overview of possible options.

Motor

Turnigy Aerodrive SK3 - 2836-1040kv Brushless Outrunner

With this motor Kodo II will be no rocket. But it is enough for a little bit of fun. On top of that, it will fit nicely into the fuselage and you should have no problem setting the CG.

I recommend to use motor weighting roughly 80g. You should be able to fit inside motors with diameter up to 28mm.

Suitable propeller sizes: 9x6, 9x7, 10x6.

ESC

HobbyKing 40A (2~6S)

Optionally you can use programming card but It should work fine out of the box.

BATTERY

Turnigy nano-tech 1000mah 3S 25~50C Lipo Pack or Turnigy 1250mAh 3S 30C Lipo Pack (Long)

You can choose other battery but keep your size and weight similar to the examples above (80g-100g). Using these, ESC and battery are installed as much as possible in the front of the fuselage next to each other (parallel config). For heavier batteries you need to put ESC into the front of the fuselage area and battery behind it closer to the servos (series config).

When it comes to glider fuselage Turnigy nano-tech 950mah 2S 25~50C Lipo Pack will just about fit into the front of the fuselage. You will need roughly 50g of additional ballast.

RECEIVER

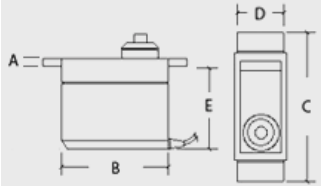
This depends on your transmitter. Only requirement is to have 7 channels if you want to have flaps on your wing, otherwise 5 channels is enough. (4 if you are going for pure glider - no motor)

SERVOS

Hextronik MG-14

It is a digital servo with metal gears for reasonable price. You can use 6 or 4 of these, depending if you want to have flaps on your wing (2 for the ailerons, 2 for the flaps, 2 in the fuselage).

Servo mounts will fit servos with dimensions up to:
A = 2 mm, B = 24 mm, C = 33 mm, D = 12 mm, E = 20 mm



Settings and flying

CG

63 mm – 66 mm from wing leading edge measured next to the wing root.

I strongly recommend to use 63mm for first flight. Setting your CG exactly is very important!

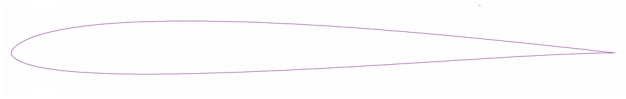
Control throws

Rudder/elevator: up 8 mm, down 8 mm

Aileron: up 14 mm, 7 mm down

Template for tail zero position

You can print this template, cut it out of the paper and use it for setting zero position of the tail.



Wings to fuselage attachment

There are no or only very little forces acting on the wings in horizontal direction. There is no need to attach wings too firmly to the fuselage. It also helps to absorb the energy during landing when the wings can detach easily.

Joiner rods on the fuselage have diameter of 6 and 4 mm, carbon spars in wings have inner diameter of 6 and 4 mm. To attach wing to the fuselage slide wing on joiner rods all the way in until small fork on the fuselage engages with pin on the wing root cap. This way of wing securing allows wing to detach during rough landing.

Happy flying

Tomas

support@kragamodels.com