RYAN STM

MANUAL

F.IIIII

ABOUT THE RYAN STM

The Ryan ST was designed by Paul Ryan in 1933 and flew for the first time in June 1934. ST stands for sport trainer.
The Ryan STM was the military variant, very similar to the STA (A for aerobatic) with a stronger engine than the ST.
The construction was a semi-monocoque fuselage with alclad sheeting. The outer wing sections was wooden ribs and alclad spars with canvas cover.

STM primary users
United States Army Air Forces (YPT-16)
Netherlands East Indies Army and Navy
Royal Australian Air Force

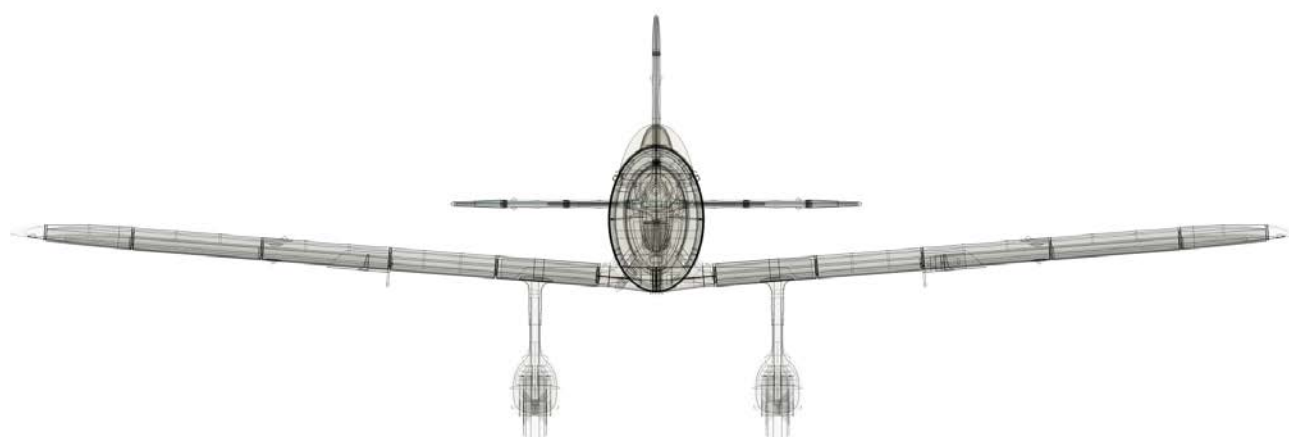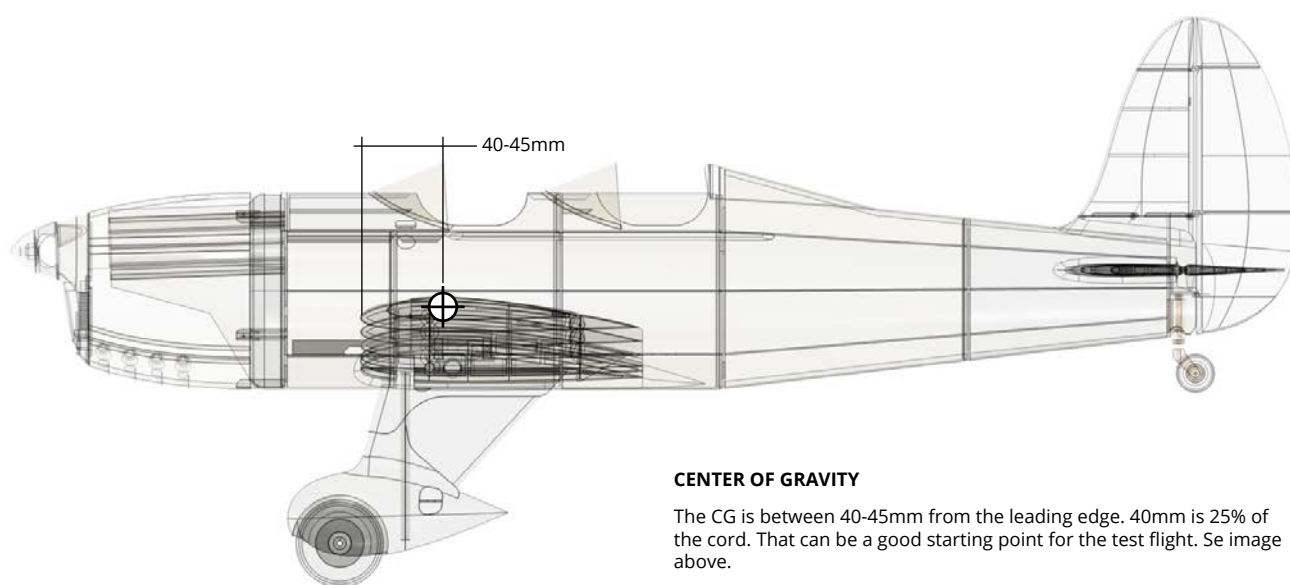Ryan STM in the Netherlands East Indies Army colors

Ryan YPT-16

ABOUT THE MODEL

Wingspan	1000mm
Length	736mm
Take off weight	≈650g
Motor	2308 or 2208 1800KV
Battery	2S 1300 mAh
Propeller	9x6
Wing loading	≈45g/dm^2

■ All thin wall print files are designed for Prusa Slicer. There will be problems with certain details in Cura.
■ The parts are designed to be printed with LW-PLA from Colorfabb (if nothing else is stated). If you use some other brand of LW-PLA or ordinary PLA please take your time and make sure that the layer adhesion is good.

40-45mm

CENTER OF GRAVITY

The CG is between 40-45mm from the leading edge. 40mm is 25% of the cord. That can be a good starting point for the test flight. Se image above.

PRINTER SETTINGS

Printer setting	A	B	C	D	E
Material	LW-PLA	LW-PLA	LW-PLA	VarioShore TPU	PLA
Quality					
Layer height	0,2mm	0,2mm	0,2mm	0,2mm	0,2mm
Line width	0,4mm	0,4mm	0,4mm	0,4mm	0,4mm
Walls					
Perimeters	1	1	1	2	2
Vase/spiral-mode	Yes	No	No	No	No
Top/bottom					
Top layers	0	0	2	4	3
Bottom layers	7	7	7	4	3
Infill					
Infill density	0	0	6%	10%	15%
Infill pattern	—	—	Gyroid	Gyroid	Gyroid
Supports	No	No	No	No	No
Retract distance	0,5mm	0,5mm	0,5mm	No change	No change

COLORFABB'S LW-PLA

The use of LW-PLA has really been a game-changer for 3d-printed airplanes. Half the weight and nicer surface finish.
   The only con is that it's oozing a lot.
To overcome this you can design the parts for printing with as few retractions as possible. That is what I've tried to do with this J29 Tunnan.

Speed
With LW-PLA you have to drop the speed quite drastically. Colorfabb recommends 40-100mm/s but I found that 25mm/s makes much more clean and accurate parts.

Temperature and Extrusion multiplier
In my settings I use 250° and 0.45 for Extrusion multiplier. To get it right for your machine I strongly recommend that you do a test cube and try different temperatures and multiplier settings till you get a wall thickness of 0.4mm.

Retraction
I dropped the retraction to 0.5mm. If you have the same settings as ordinary PLA the nozzle will clog eventually.

Slice gap closing radius
To get the inner structure to print correctly, change the settings of the "slice gap closing radius" to 0.001mm.
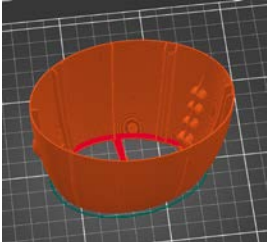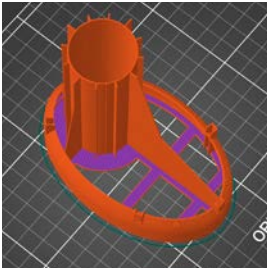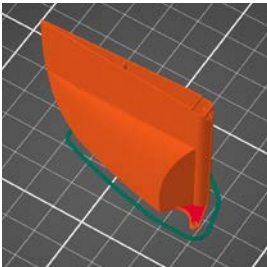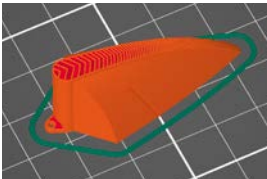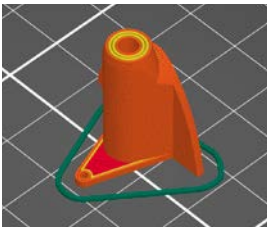You find it in the Print settings tab and under Advanced.
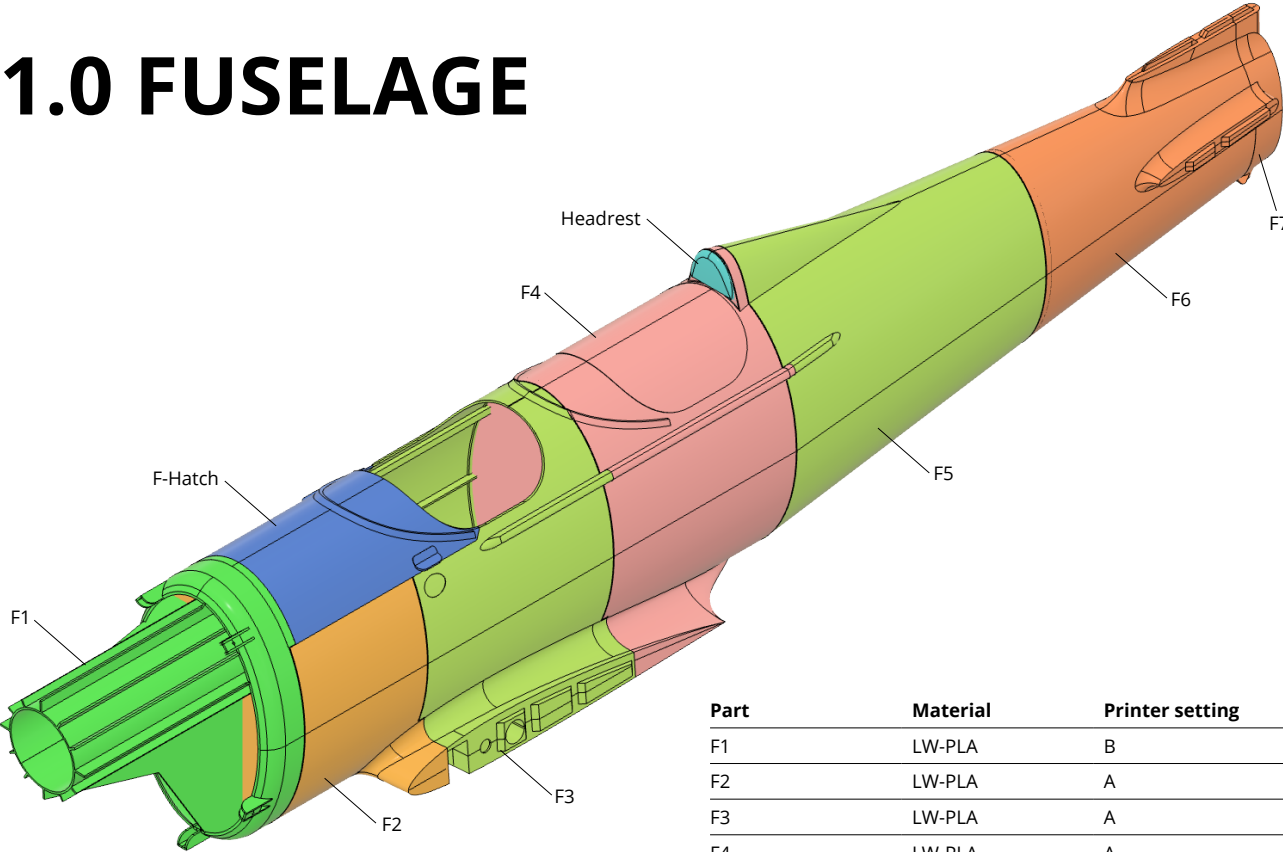
Slicer
I strongly recommend you to use Prusa slicer. Get it here for free. All thin wall parts is designed for Prusa slicer in mind.

CHANGELOG

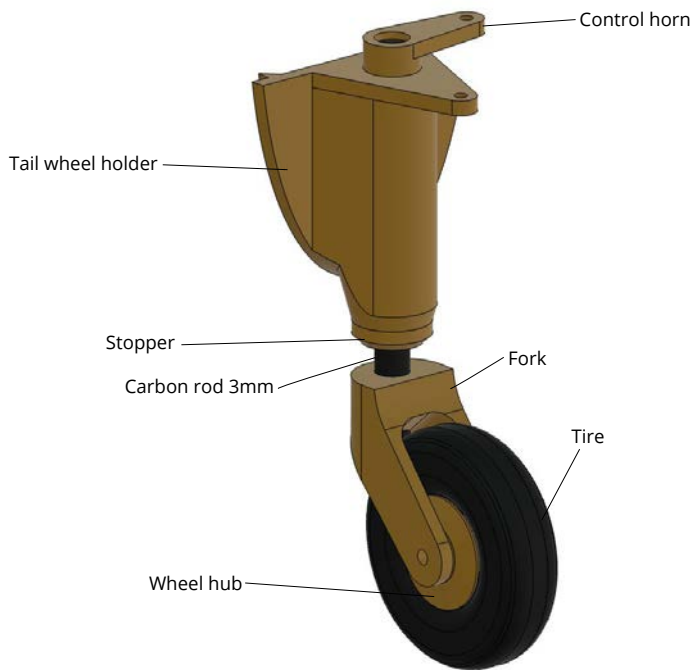|	Changed files in V2.0	Reasons for change
	Cowl2	A little more to scale and more stable. Now it's 2 vertical walls thick.
	F1	Small adjustments to fit the new cowl.
	Rudder3	Adjustments to fit the new hinge.
	Rudder4	Adjustments to fit the new hinge.
	Tail wheel holder	I combined the tailwheel holder with the rudder hinge for easier assembly.

1.0 FUSELAGE

Headrest

F4

F-Hatch

F1

F2

F3

F7

F6

F5

Part	Material	Printer setting
F1	LW-PLA	B
F2	LW-PLA	A
F3	LW-PLA	A
F4	LW-PLA	A
F5	LW-PLA	A
F6	LW-PLA	A
Ff7	LW-PLA	B
F-hatch	LW-PLA	B
Headrest	LW-PLA	C
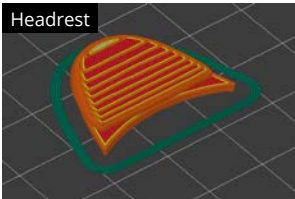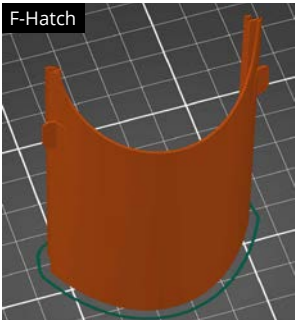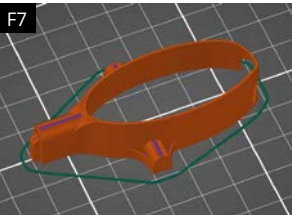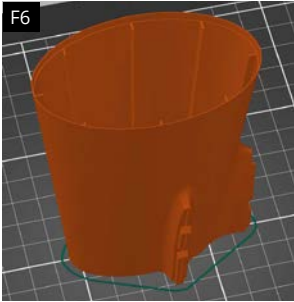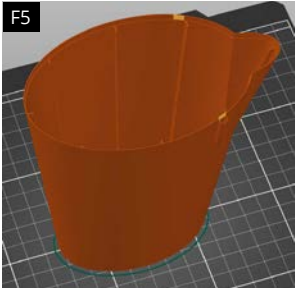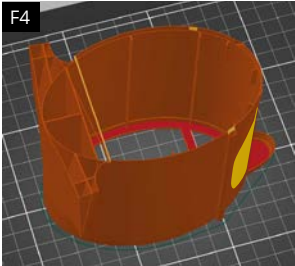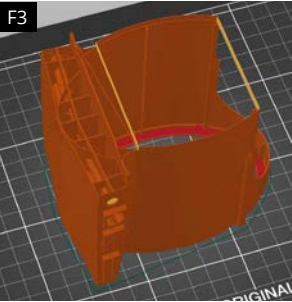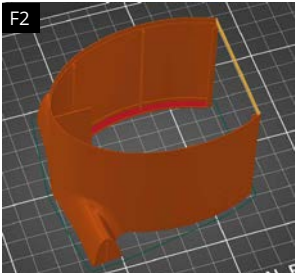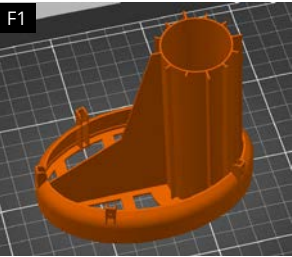
Cut away all the parts marked in Yellow in the images.
Glue F1–F6. Whait with F7 until you made the tail-wheel assembly.

SLICER PLACEMENT

F1

F2

F3

F4

F5

F6

F7

F-Hatch

Headrest

1.1 TAILWHEEL ASSEMBLY

Control horn

Tail wheel holder

Stopper

Carbon rod 3mm

Fork

Tire

Wheel hub

Print all the yellow parts with PLA or PETG for strngth. The tire is printed with TPU or VarioShore TPU. I used VarioShore TPU with great success.
The carbon tube is 3mm.

Glue the whole assembly together before gluing it to F6. It's also important to make the control arm and put it in the control horn before gluing it to the fuselage.
And of coarse make sure it's able to swivel.

Part	Material	Printer setting
Control-horn	PLA	E
tail-wheel-holder	PLA	E
stopper	PLA	E
fork	PLA	E
wheel-hub	PLA	E
tire	VarioShore TPU	D

PLA PARTS

Tire
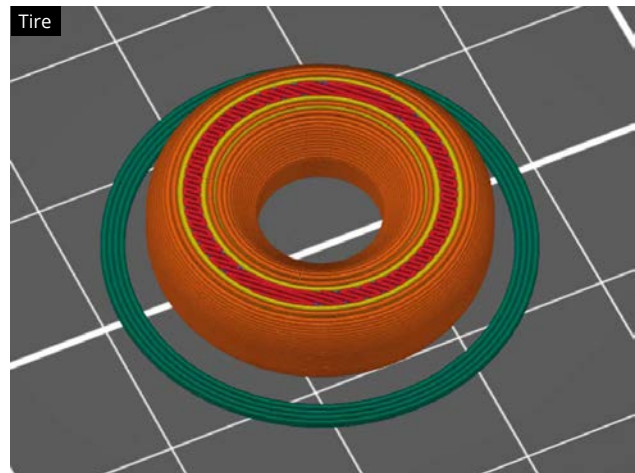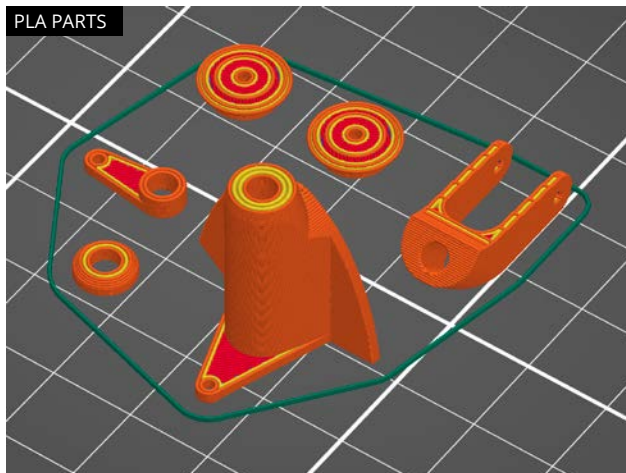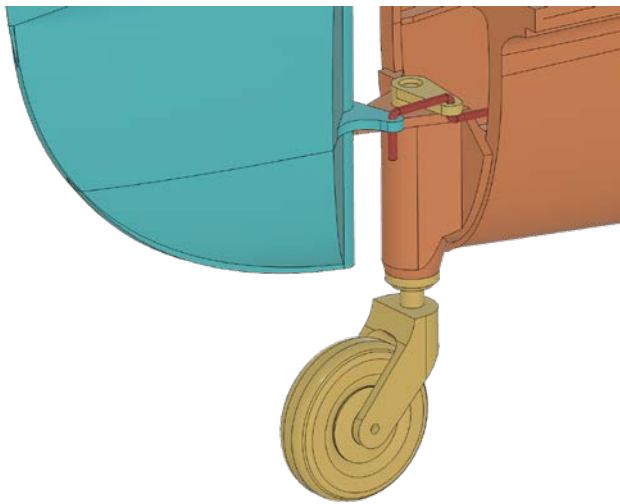
RUDDER PUSHROD

Make the pushrodd of 1,2 mm piano wire. Use this template.
In the picture to the left you see how it's supposed to fit.
I've also made a video on YouTube:
https://youtu.be/IGe5jnHN7kw?si=IEzU1sL0dVpif_Zc

Order of assembly
Start with putting the servo arm in the tailwheel horn. Insert the pushrod to the fuselage from the rear so it's positioned above the servo.
Glue the whole assembly to F6.
Glue F7 in place.
Then you're done for now.

9,55 mm   Total length: 230 mm
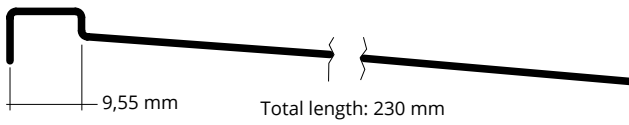
1.2 COWLING

Part	Material	Printer setting
Cowl1	LW-PLA	Special*
Cowl2	LW-PLA	A
Motor	LW-PLA	C
Exhaust	LW-PLA	Special**

*Cowl1: LW-PLA
Vertical shells: 1
Bottom layers: 0
Top layers: 3
Support: Yes
Infill: No
Spiral vase: No

**Exhaust: LW-PLA
Vertical shells. 2
Bottom layers: 2
Top layers: 0
Support: No
Infill: No
Spiral vase: No
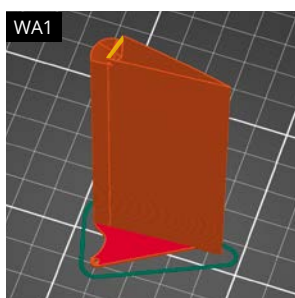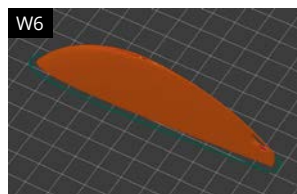
Cut away the yellow marked parts on the exhaust pipes.
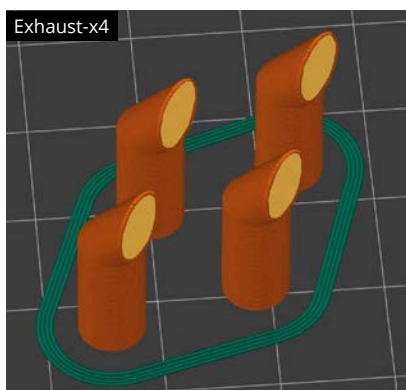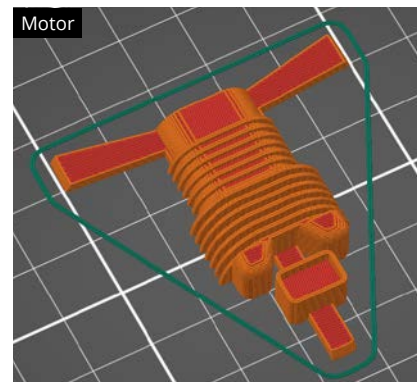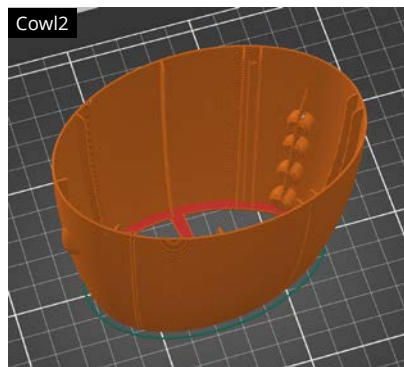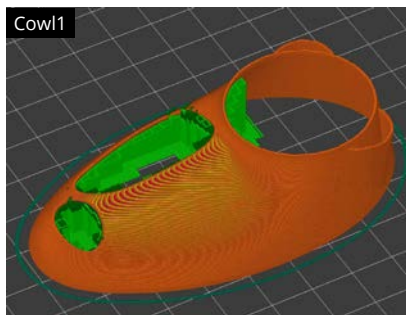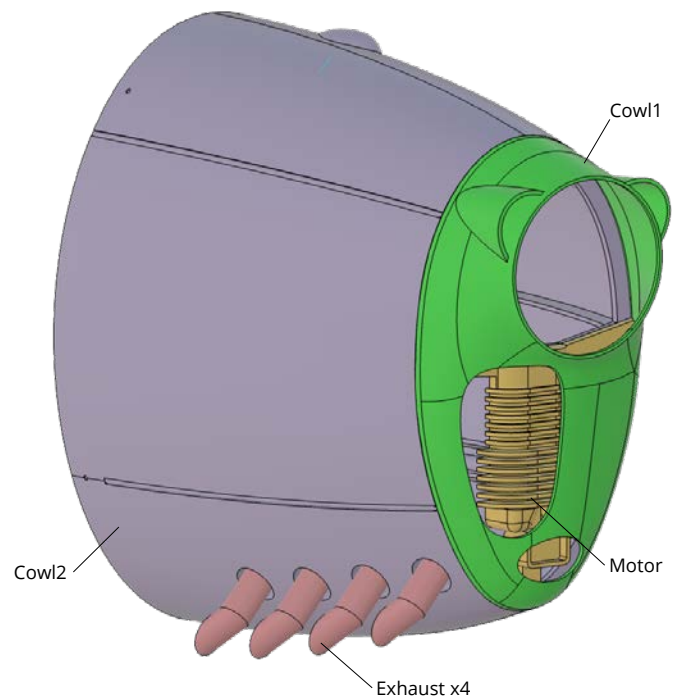
2 WINGS
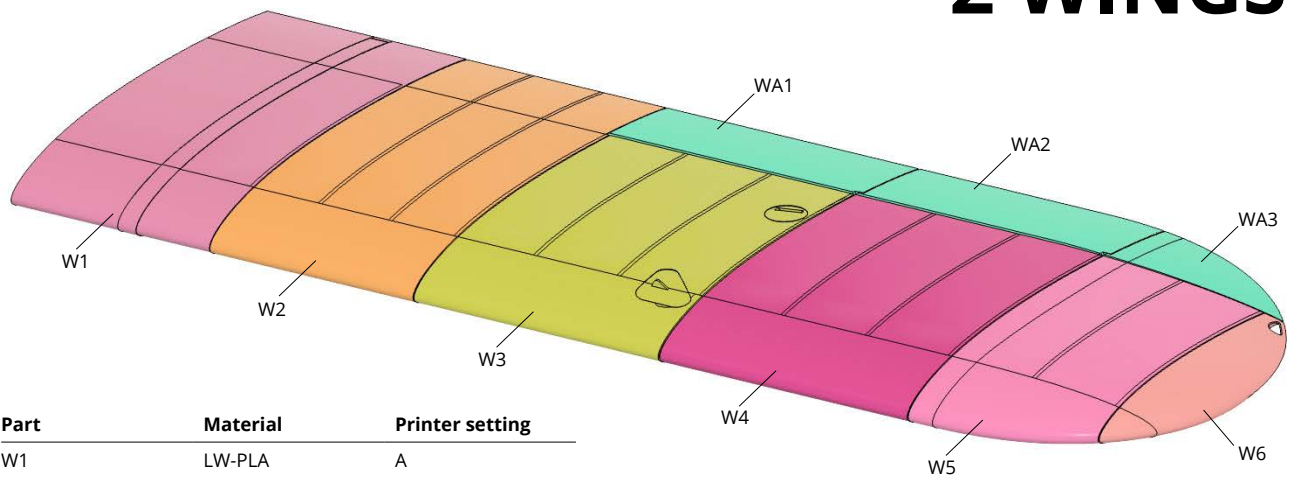
Part	Material	Printer setting
W1	LW-PLA	A
W2	LW-PLA	A
W3	LW-PLA	A
W4	LW-PLA	A
W5	LW-PLA	A
W6	LW-PLA	C
WA1	LW-PLA	A
WA2	LW-PLA	A
WA3	LW-PLA	A

Cut away all the parts marked in Yellow in the images.

Glue the parts together w1-w6.
Use a 5mm carbon rod as a spar. You don't need to glue it.
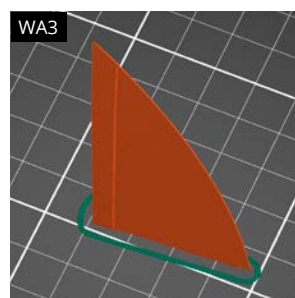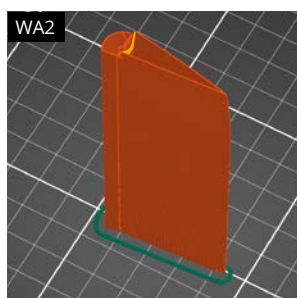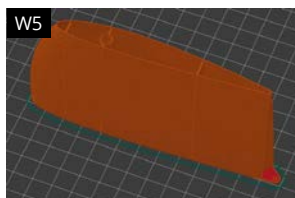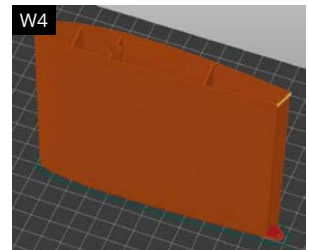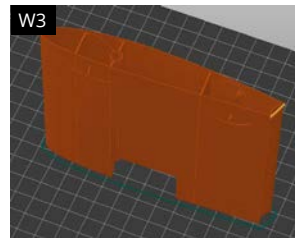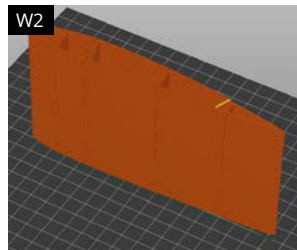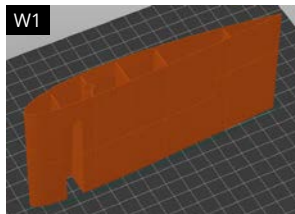
AILERON ASSEMBLY
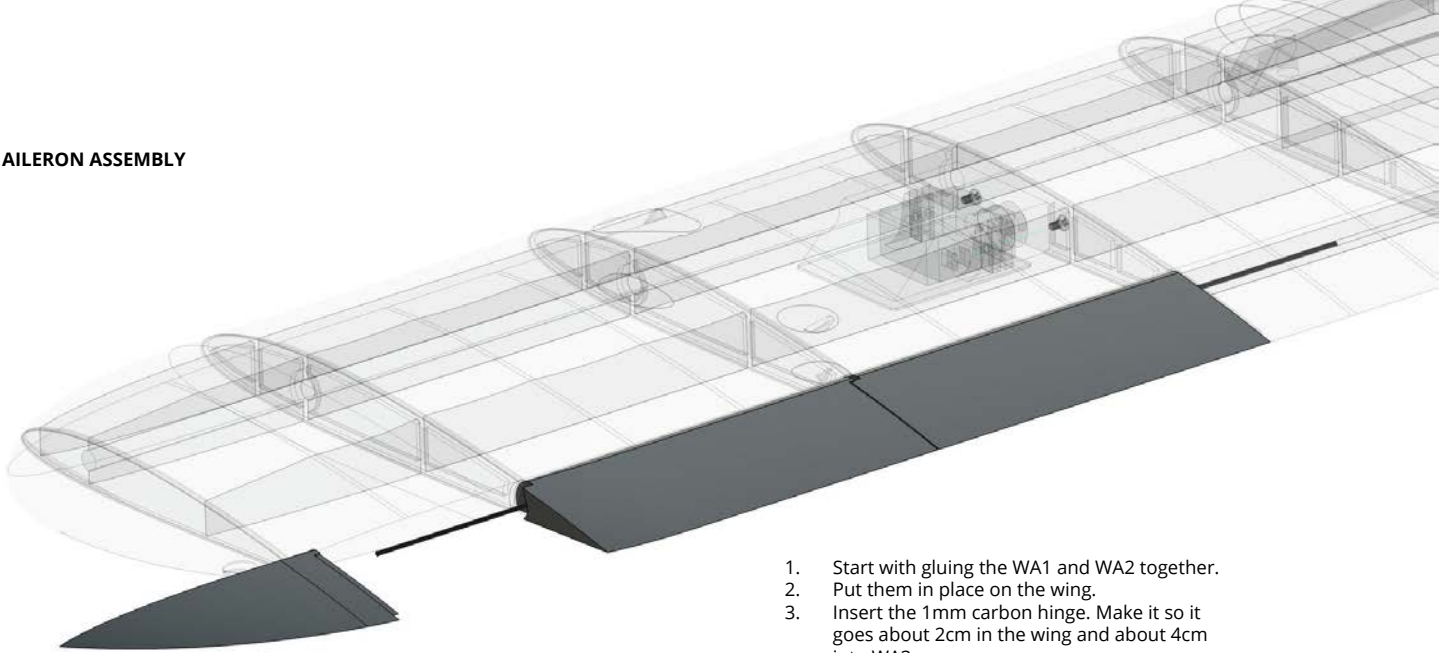
1. Start with gluing the WA1 and WA2 together.
2. Put them in place on the wing.
3. Insert the 1mm carbon hinge. Make it so it goes about 2cm in the wing and about 4cm into WA3.
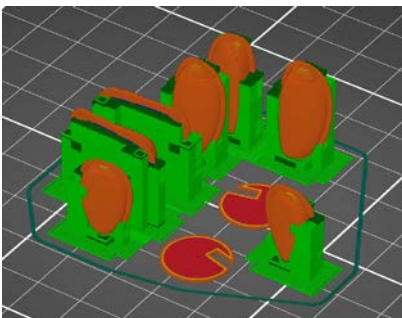4. Glue WA3 in place. Careful not to out any glue on the carbon hinge.
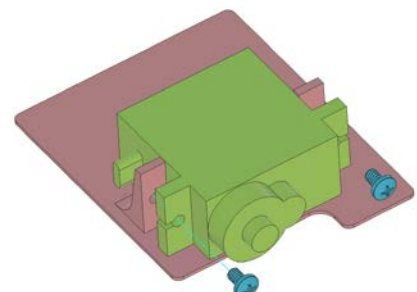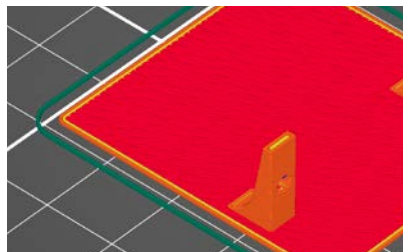
2.1 WING DETAILS

WING STRUTS
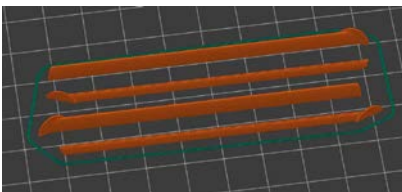
Part	Material	Printer setting
wing-strut-1	PLA	E
wing-strut-2	PLA	E
wc1	PLA	E*
wc2	PLA	E*
wc3	PLA	E*
wc4	PLA	E*
WA3	PLA	E*
servo-hatch	PLA	E

*Note! For the wire-covers, use supports and arrange them upright on the printbed.

WIRE COVERS

SERVO HATCH

Screw the servo to the hatch and glue the hatch to the wing.

3 LANDING GEAR

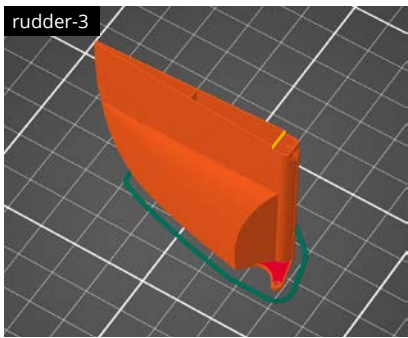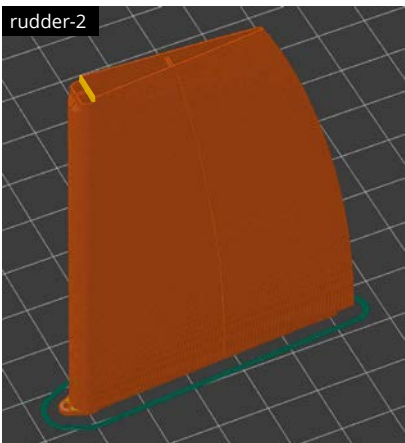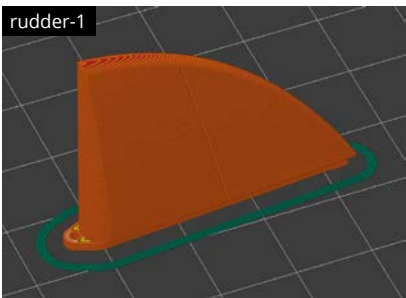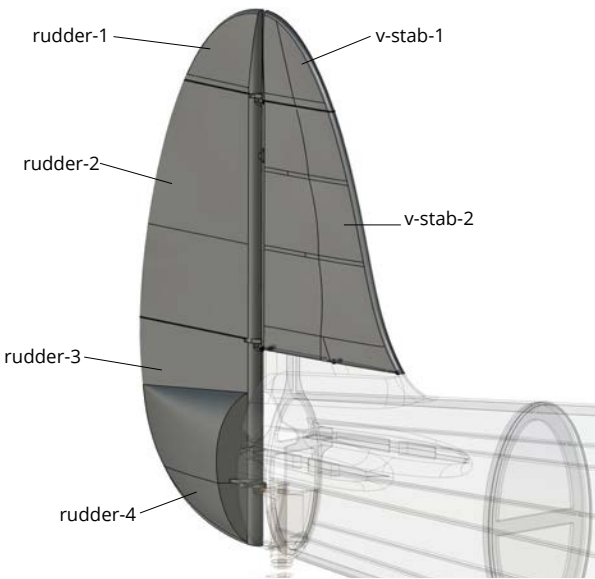| Part	Material	Printer setting
lg1	LW-PLA	C
lg2	LW-PLA	C
wheel-hub	PLA	E
spar	PLA	E
tire	VarioShore TPU	D

Glue LG1 and LG2 together. Reinforce them by gluing a 5mm carbon rod in the channel. Make the carbon rod long enough to go through the spar. If you want extra reinforcement. Put a 5mm carbon rod in the spar between the holes where the landing gears is supposed to sit.
The wheel axle is a 3mm carbon rod.

SPAR

LG2

LG1

TIRE

WHEEL HUB

LG1

LG2

SPAR

TIRE

WHEEL HUB
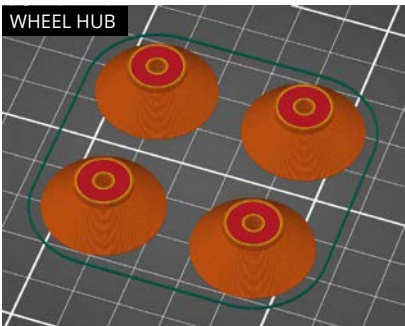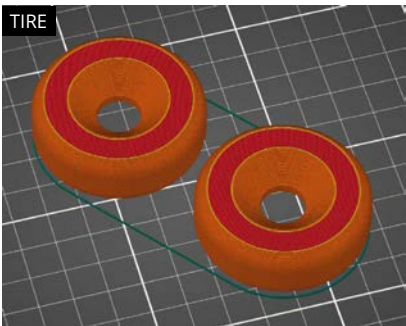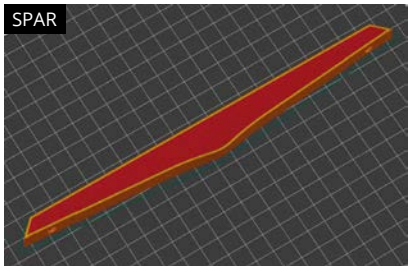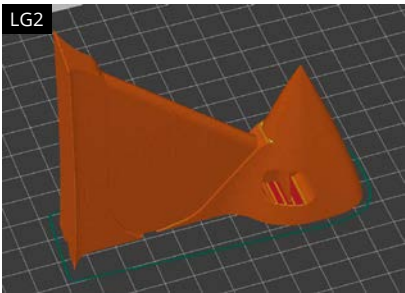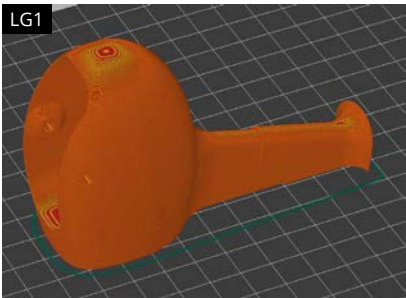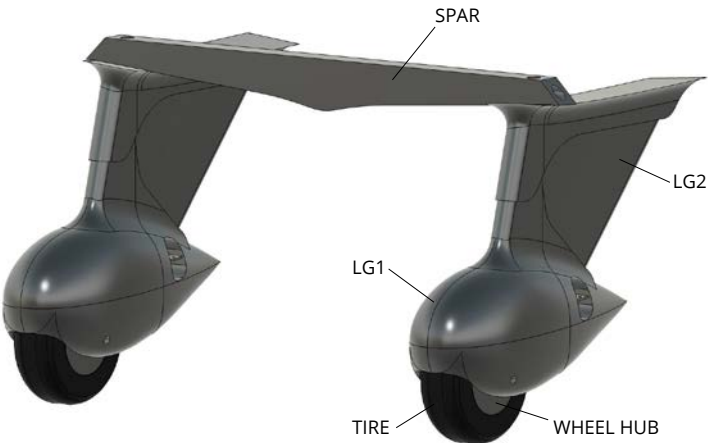
4 VERTICAL STAB AND RUDDER

| Part	Material	Printer setting
rudder-1	LW-PLA	A
rudder-2	LW-PLA	A
rudder-3	LW-PLA	A
rudder-4	LW-PLA	A
v-stab-1	LW-PLA	A
v-stab-2	LW-PLA	A

Cut away all the parts marked in Yellow in the images.

rudder-1

rudder-2

rudder-3

rudder-4
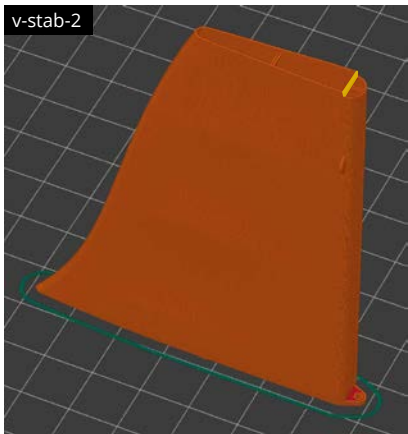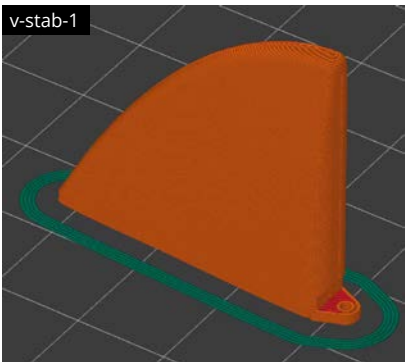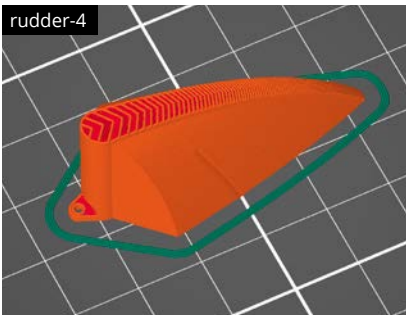
v-stab-1

v-stab-2

4 HORIZONTAL STAB AND ELEVATORS
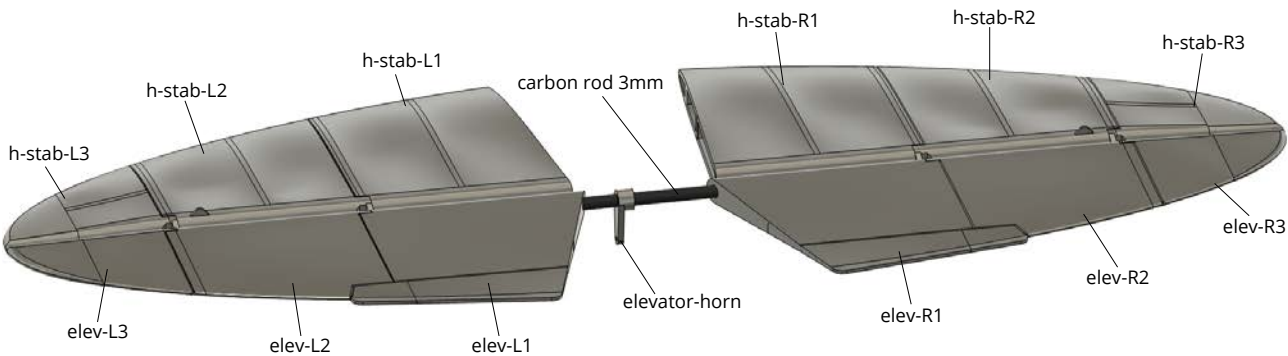
Part	Material	Printer setting
h-stab-1	LW-PLA	A
h-stab-2	LW-PLA	A
h-stab-3	LW-PLA	A
elev-1	LW-PLA	A
elev-2	LW-PLA	A
elev-3	LW-PLA	A
elevator-horn	PLA	E

Cut away all the parts marked in Yellow in the images.
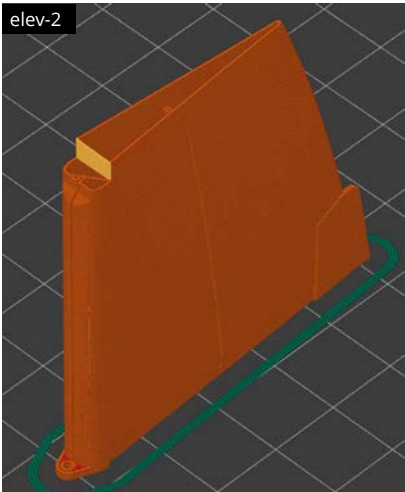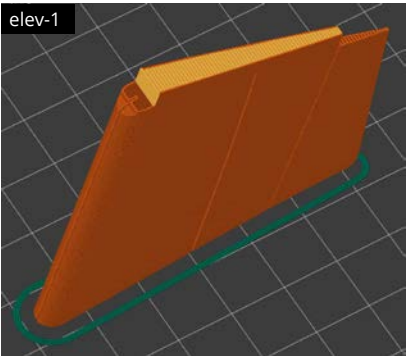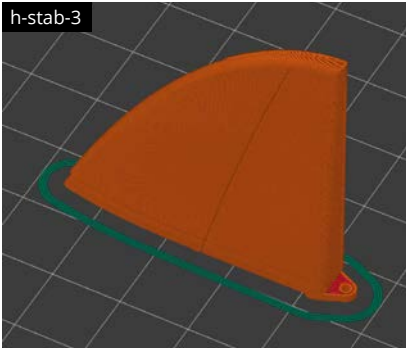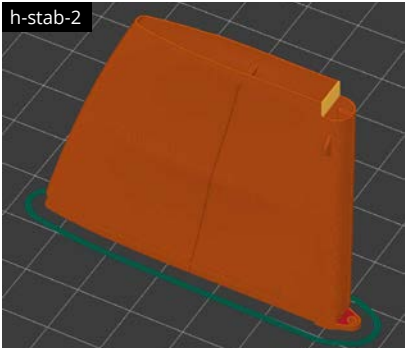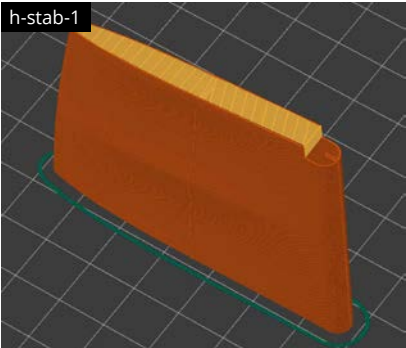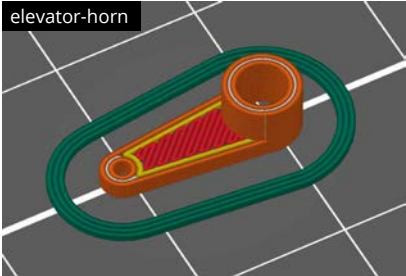
6 PREFLIGHT CHECK

CENTER OF GRAVITY

To get the right flight characteristics, getting the center of gravity right
is very important. Flying a tail-heavy plane is not fun.
The CG should be 40-45mm from the leading edge. 40mm is 25% of the
cord. That can be a good starting point for the test flight.

Glue the battery holder last. Put a battery in place and find the position
so the CG gets correct. Then glue it in place.

Happy flying!

Flodin Modelworks
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