

JETWORKS



Fairchild
A-10 Thunderbolt II
Parkjet mk2



4th Generation Jet Fighter

Construction Guide

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'Hog' History

Affectionately called the "Warthog" for its aggressive look and often painted with teeth on the nose cone, the A-10 Thunderbolt II is the U.S. Air Force's primary low-altitude close air support aircraft. The A-10 is perhaps best known for its fearsome GAU-8 Avenger 30mm gatling gun firing armor-piercing depleted uranium and high explosive incendiary rounds.

The A-10 Thunderbolt II has excellent maneuverability at low air speeds and altitude, and is a highly accurate and survivable weapons-delivery platform. The aircraft can loiter near battle areas for extended periods of time and operate in low ceiling and visibility conditions. The wide combat radius and short takeoff and landing capability permit operations in and out of locations near front lines.

The pilots are protected by titanium armor that also protects parts of the flight-control system. The aircraft can survive direct hits from armor-piercing and high explosive projectiles up to 23mm. Their self-sealing fuel cells are protected by internal and external foam. Manual systems back up their redundant hydraulic flight-control systems helping pilots to fly and land when hydraulic power is lost.

The first production A-10A was delivered to Davis-Monthan Air Force Base, Ariz., in October 1975. The upgraded A-10C reached initial operational capability in September 2007. Specifically designed for close air support, its combination of large and varied ordnance load, long loiter time, accurate weapons delivery, austere field capability, and survivability has proven invaluable to the United States and its allies. The aircraft has participated in operations Desert Storm, Southern Watch, Provide Comfort, Desert Fox, Noble Anvil, Deny Flight, Deliberate Guard, Allied Force, Enduring Freedom and Iraqi Freedom.

Designers Notes

The first time I saw the 'agricultural' functional lines of the A-10, It was unlike anything I had ever seen, and to be honest It took a bit of warming up to.

It is probably the most brutal flying machine in the battleground, tough, fearsome and packs a real punch with the gatling gun!

This model is at the limit of a depron sheet size, and introduces 'crush bending' technique. It is also designed to house retracts and twin 5" pushers or could be modified to take twin 64mm EDF units.

There are lots of camo patterns in existence for this bird, so you can try the Arctic, Desert or simply grey... For me I love the Euro green Camo scheme, as this is how I remember them in the 1980's flying over my parents home in the UK.

IMPORTANT. Designed for three different powerplant options, the twin pushers / EDF option are perfectly fine taking off from undercarriage but when hand launching, it is important to launch at 50% thrust levels and increase steadily to avoid the downwards angled thrust from the high mounted motors from overcoming the lift generated by the wing, forcing the plane to the ground. The tail mounted single pusher is not affected by this affect.



Construction

Before you start.



Adhesives

- > For the majority of construction :
 - UHU Creativ for Styrofoam (also called UHU POR)
 - 3M 77 Spray adhesive.
- > For wing spars and motor mounts :
 - Epoxy. (5 and 15mins cure times are the most convenient) micro-balloons can be added to reduce weight.
- > For servo's / and quick grab :
 - Hot melt glue gun - Caution if the glue gets too hot it will melt foam - test first!

Tapes

- > For holding parts tightly together whilst glue sets
 - Low tack masking tapes
- > For leading edges, hinges, general strengthening
 - 3M Gift tape (Purple - not green one!) - I prefer lightweight plastic hinges.

Cutting parts

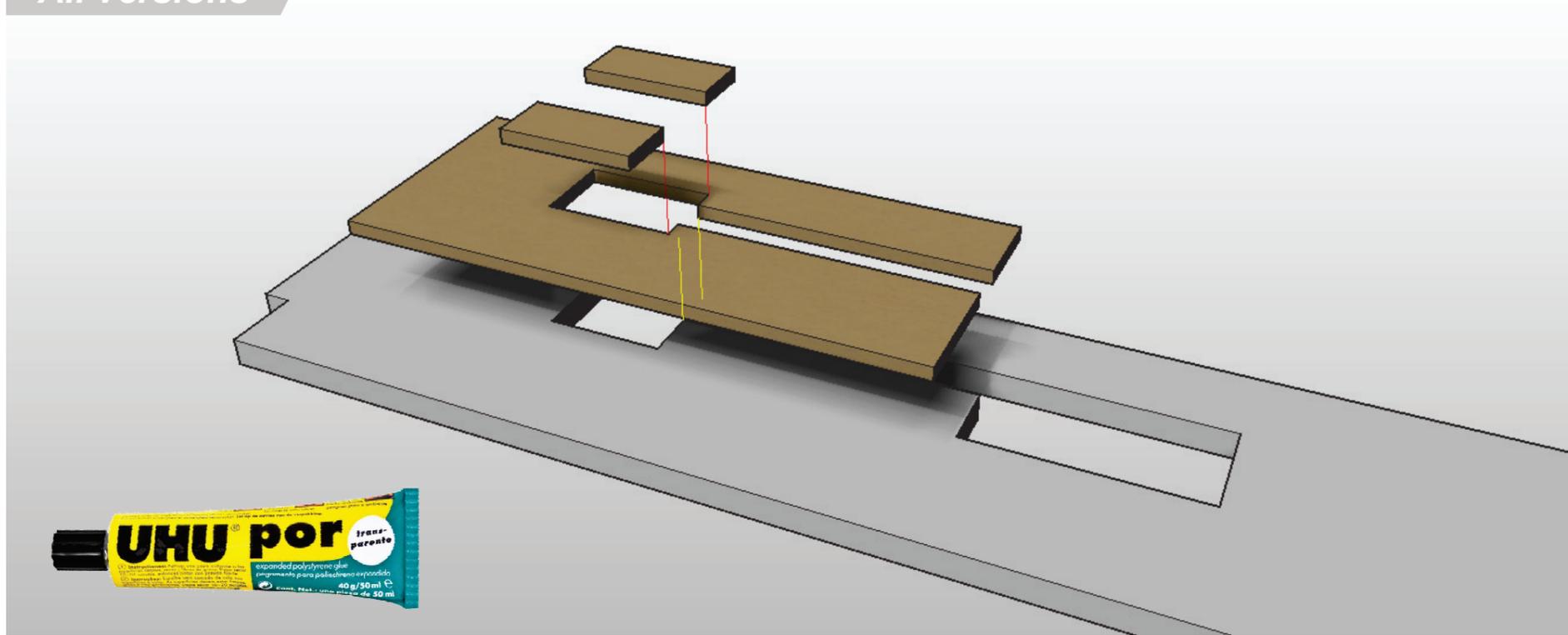
1. Print the plans,
 2. Cut around each part using scissors - allow a border of approx (1/4") 6mm
 3. Use either 3M spray mount or a very light coat of 3M 77 to the back of the parts and stick in an economical layout on the Depron foam.
 4. Using a safety rule and craft knife over a cutting mat - important! use a fresh blade otherwise it will drag and spoil the foam. (I find the stanley knife perfect) make the straight edge cuts, then the curved parts freehand.
 5. Once the parts are cut-out, keep the template stuck to the part until just before needed to help identify the parts.
 6. After use, I find it helpful to keep all the used tempates in case replacement parts need making. (the glue eventually dries and they don't stick together!)
- IMPORTANT** Wherever the plans call for marking guidelines onto the depron, please ensure that you do otherwise it can cause problems later on. I suggest you use a Sharpie Fineliner to transfer the lines.

Glueing parts together.

1. Ensure a really good fit - this will reduce the amount of adhesive used. The Bar Sander is a great tool for this.
2. Follow the adhesive instructions closely.
3. Use ordinary steel head pins to help keep the parts located whilst epoxy sets.
4. Use objects as weights such as paperweights to apply pressure whilst adhesive sets.
5. Use masking tape to apply pressure whilst adhesive sets. Also use masking tape to along the slots for the wing spars whilst gluing the carbon rod spars into the wings.

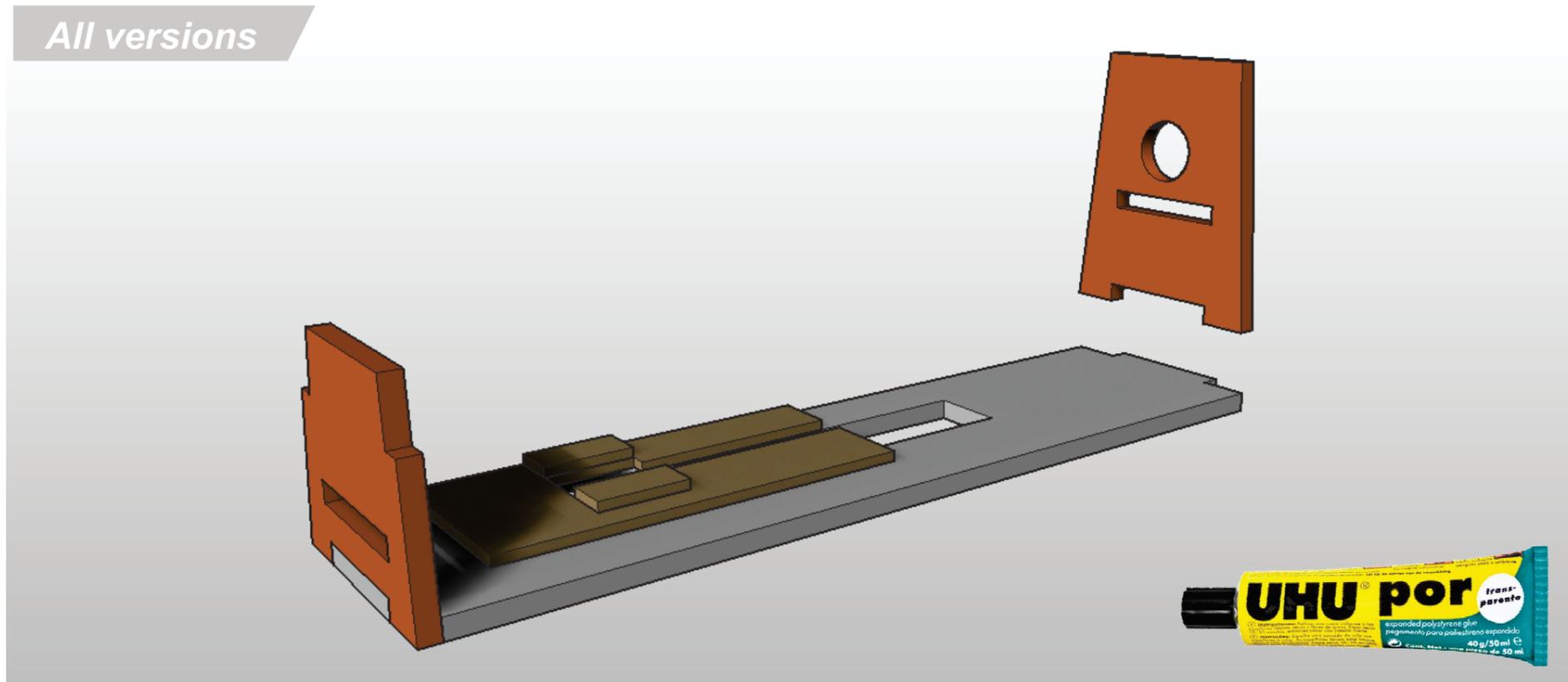


All versions



Glue the 3mm liteply **Forward retract parts** together and then to the **Retract support panel**.

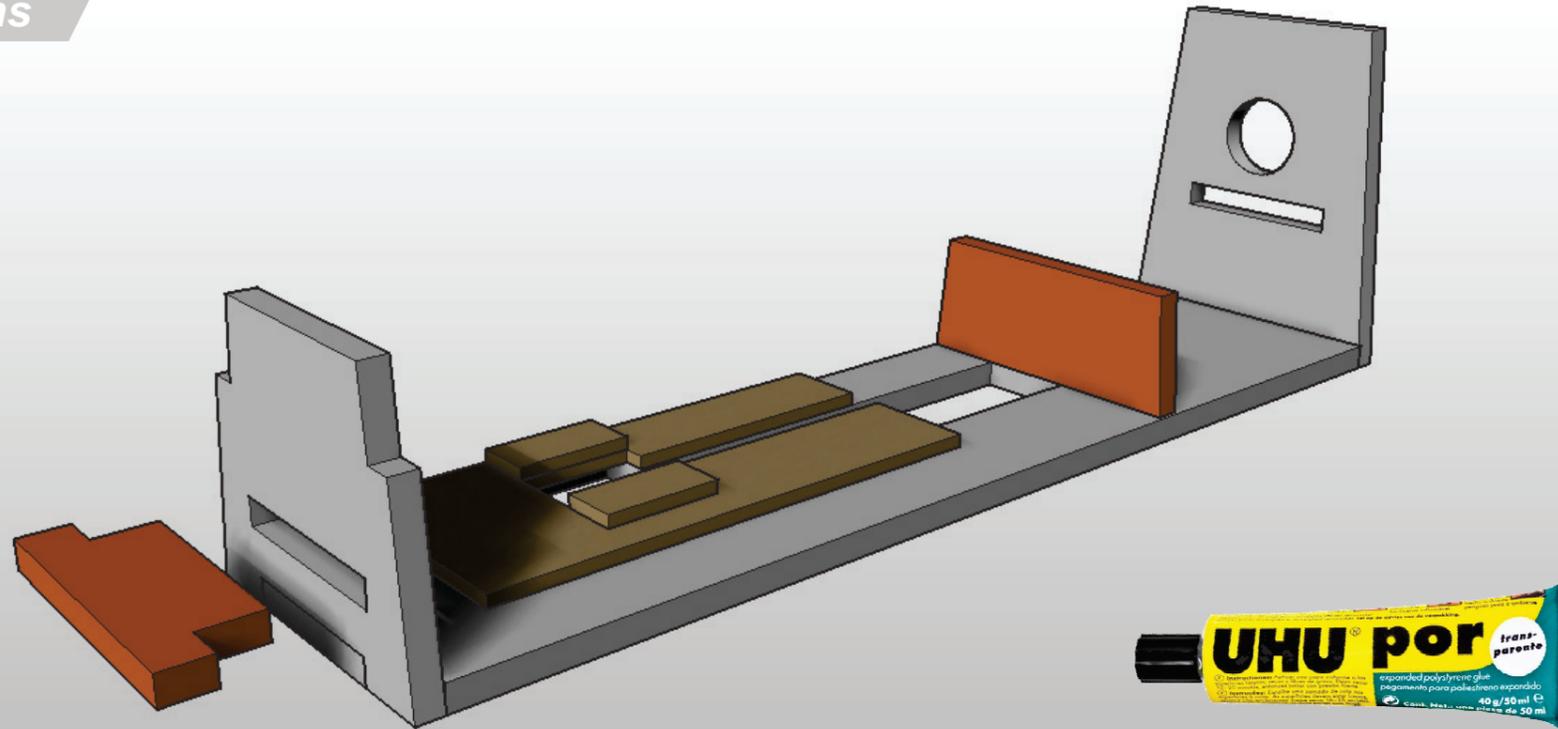
All versions



Glue **Bulkhead 1** and **Bulkhead 2** to the assembly.



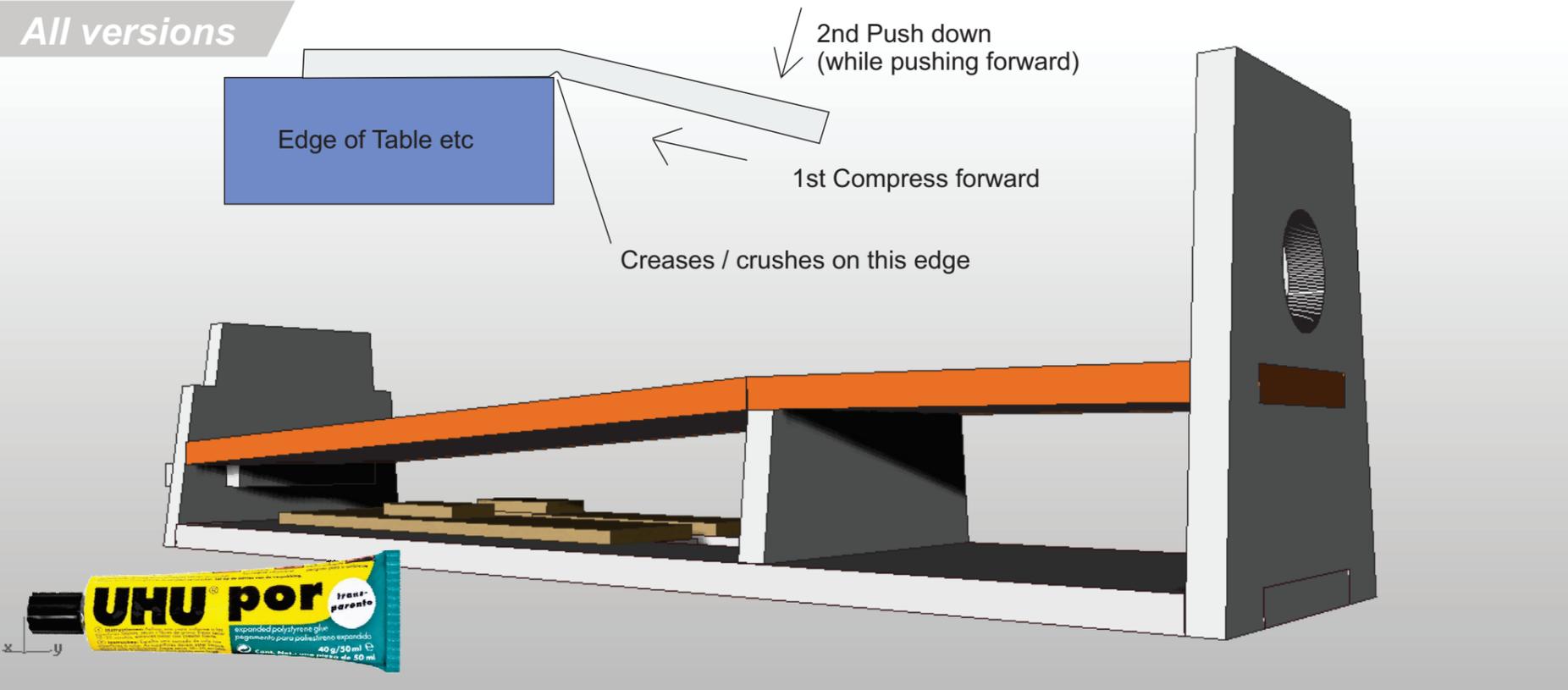
All versions



Align the **Retract space bulkhead** to the edge of the retract aperture as shown, glue in place.

Glue the **Nosecone aligner** in place.

All versions

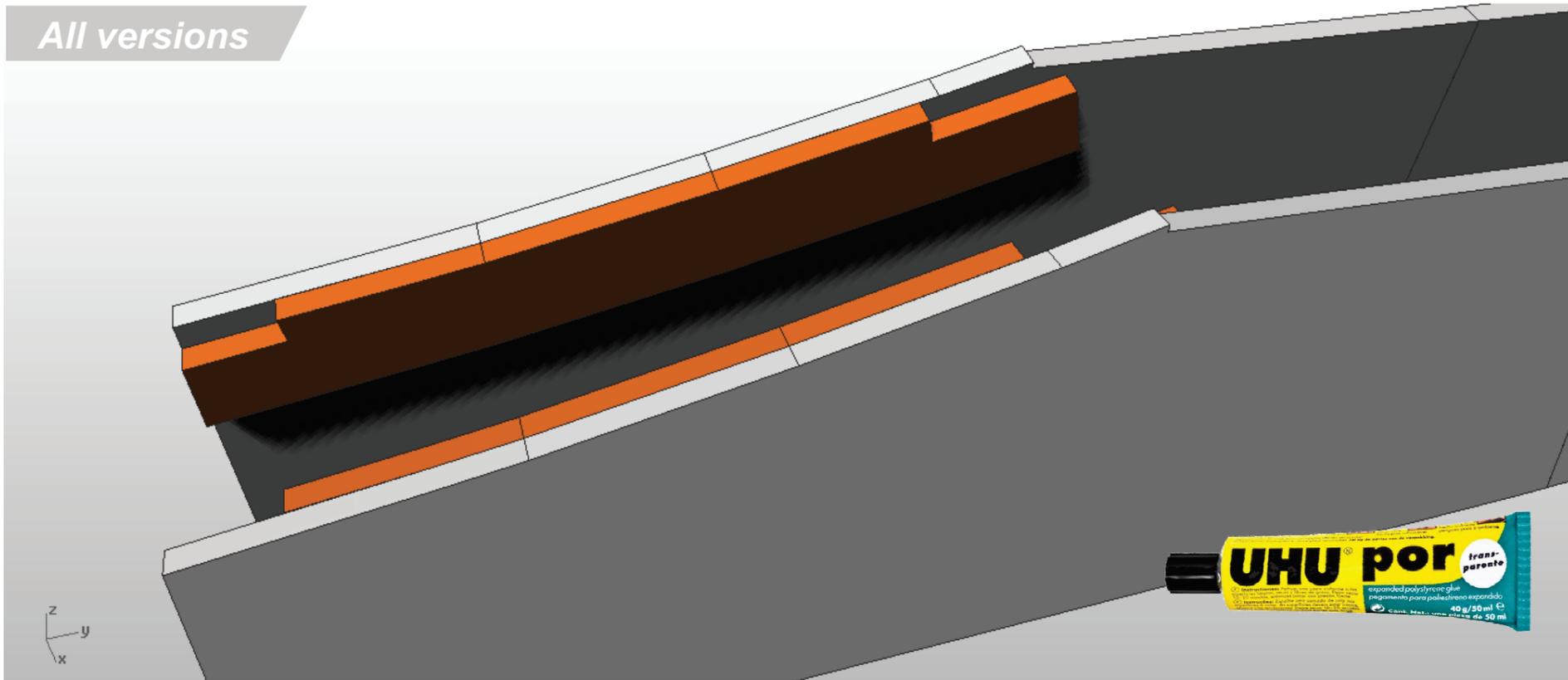


Using the previous assembly as a guide, crush bend the **forward fuselage bottom**.

Use the edge of a table and compress the edge of the foam sheet while bending, so that it crushes the underside rather than snaps the topside. (Practice on a few scraps first)



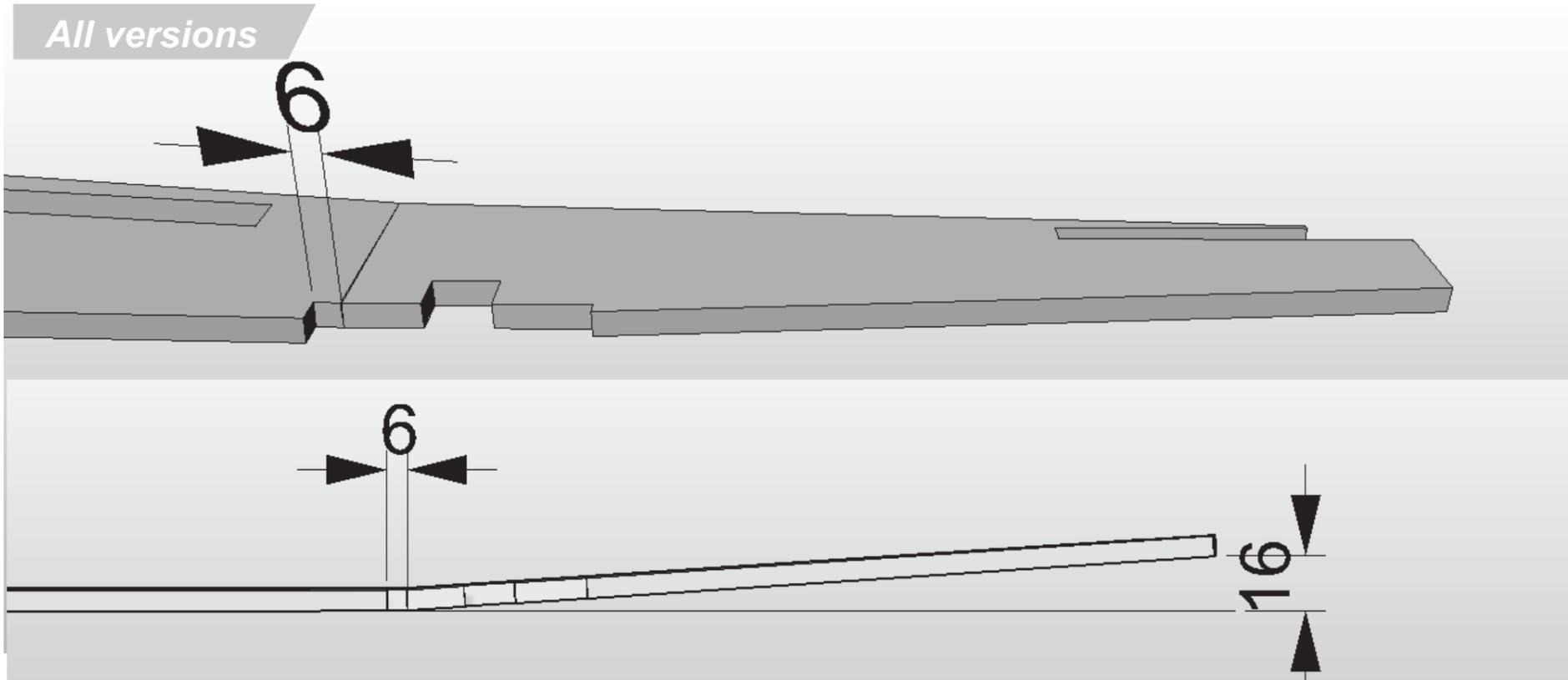
All versions



Fuselage sides - choose either 3D printed Nacelles or not. Cut to suit

Glue the **Cockpit support sides** in place.

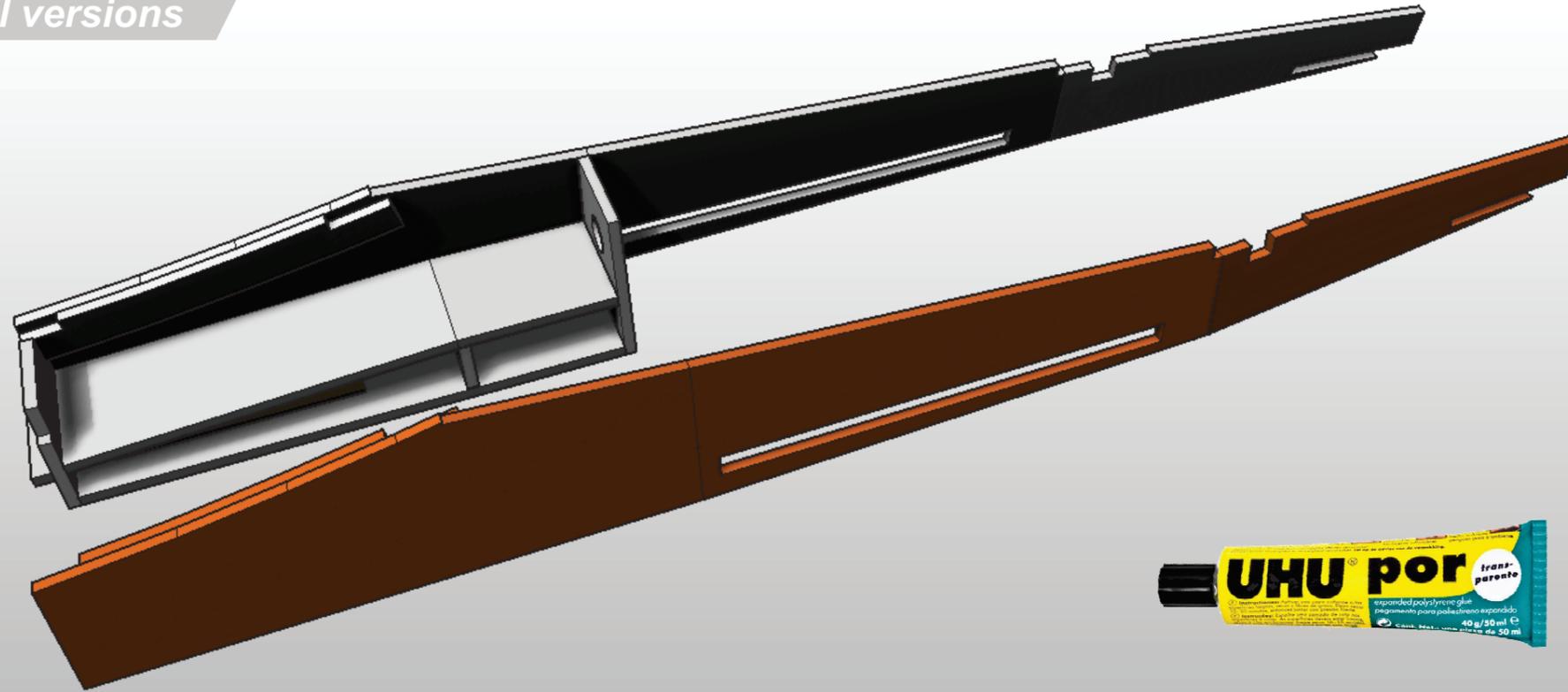
All versions



Carefully crush bend the fuselage sides as shown.

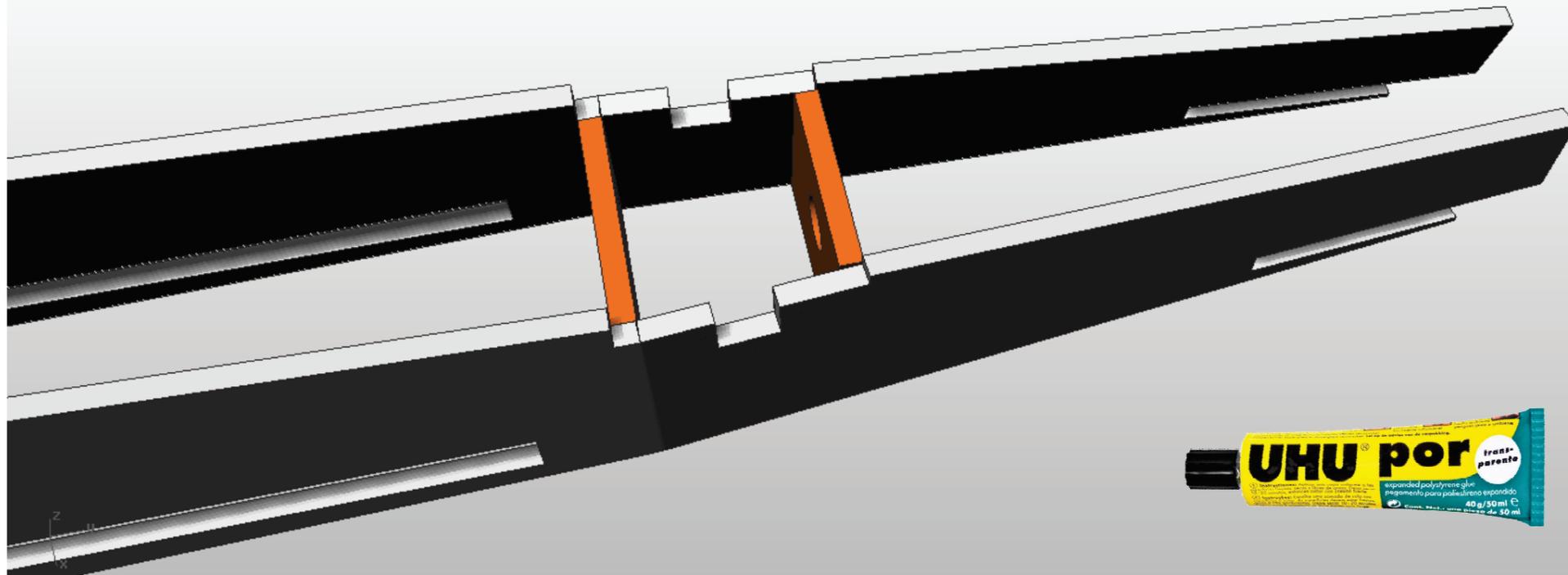


All versions



Glue the components together as shown.

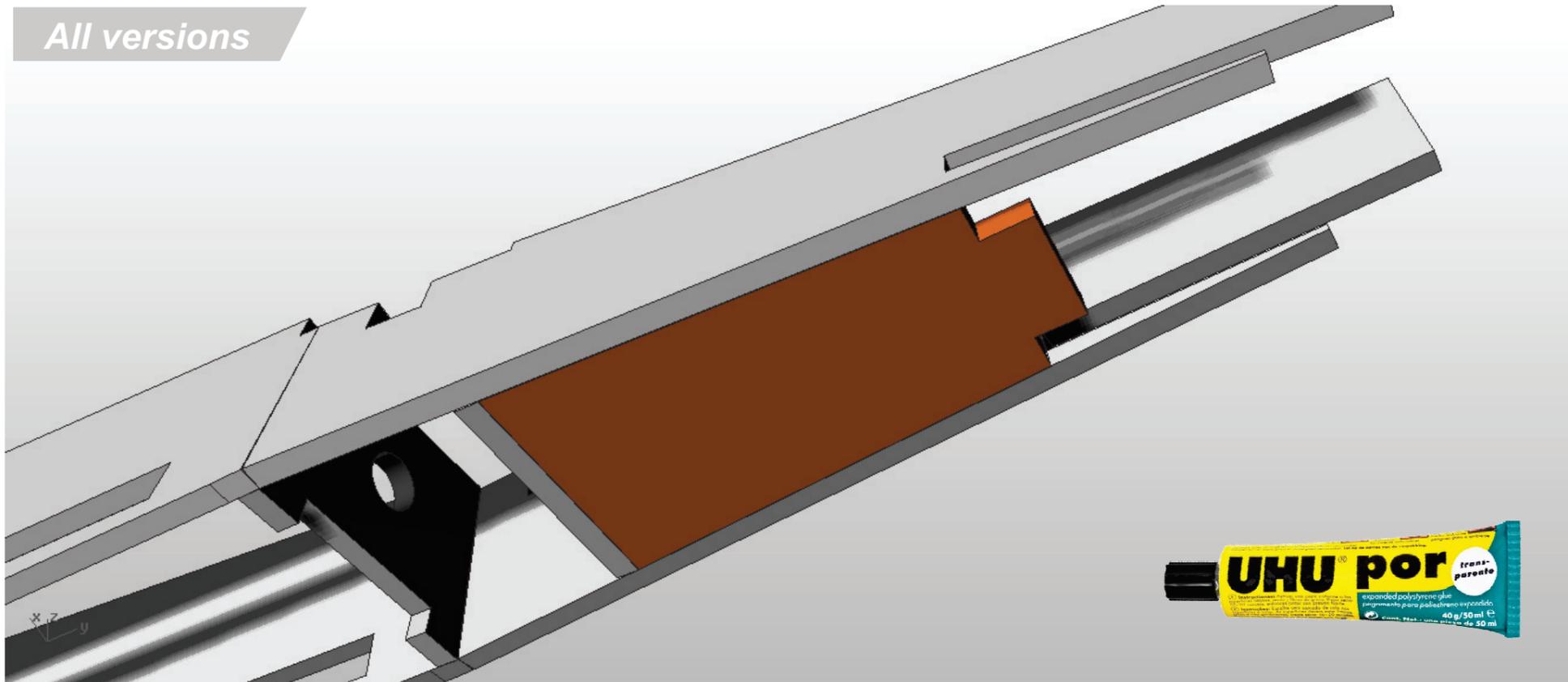
All versions



Glue **Bulkhead 3** and **Bulkhead 4** to the assembly.

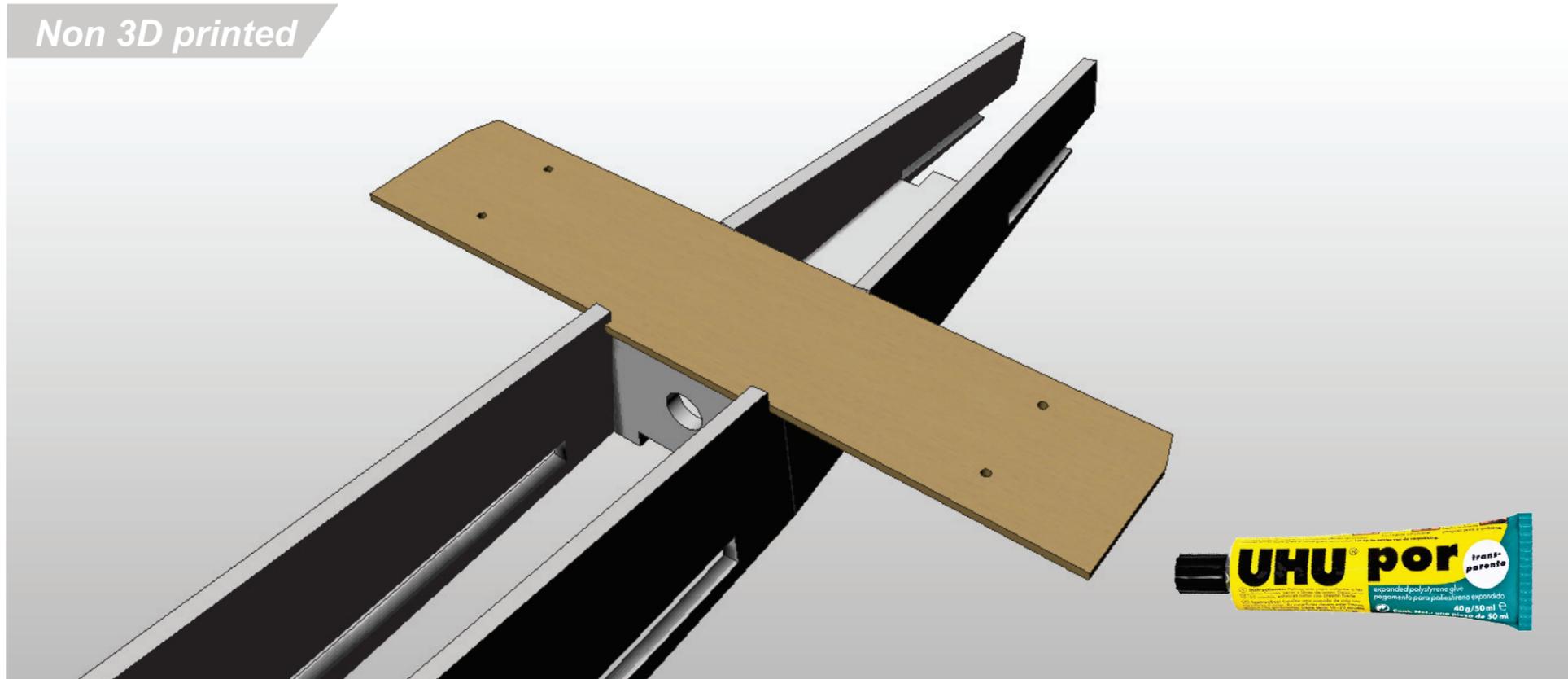


All versions



Glue the **Tail reinforcement piece** in place as shown

Non 3D printed

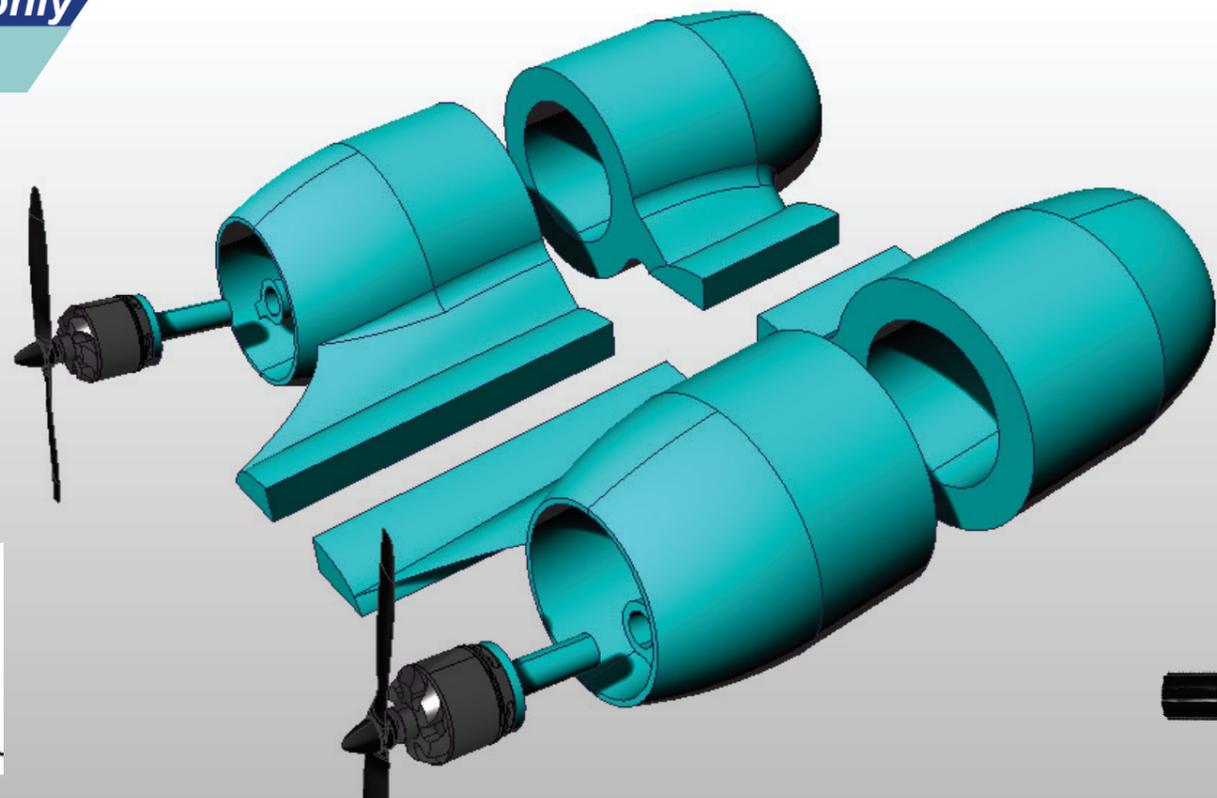


For the non-3d printed version,
Glue the 3mm Liteply **Motor spar** to the assembly.



Twin Pusher only

3D printed



**3D
Printed
Part**
(optional)



For the 3D printed twin pusher version, print out the parts and glue together using UHU por.

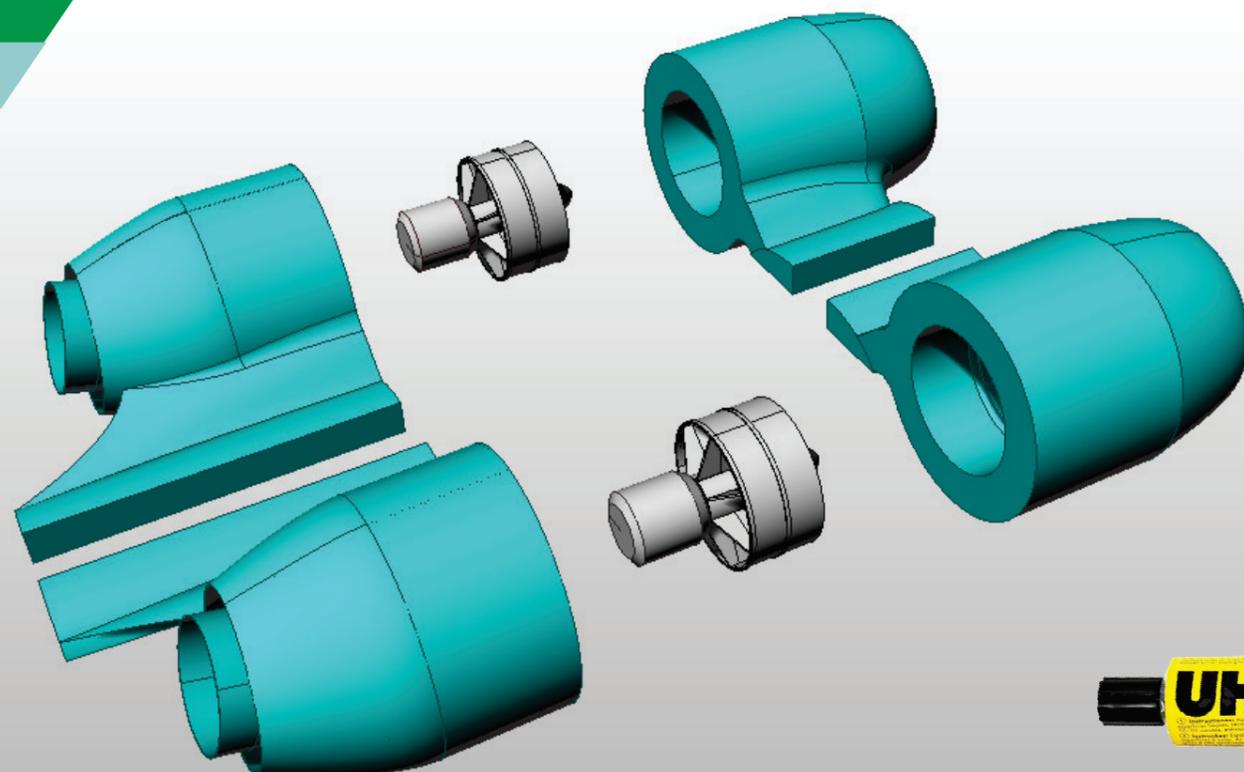
Use twin racing quad motors (4s) and 5" contra rotating props.

Run the cables through the cable slot - you may want to extend the cable length before you fix the motors in place.

I suggest you use a drop of hot melt glue to hold the motor mounts in place, so that you can remove them easily if you need to access the motor.

Twin EDF only

3D printed



For the 3D printed 50mm EDF version, print out the parts.

Use 4s FMS EDF units. Sit the EDF units in the rear nacelle part and glue in place using hot melt glue (sparingly)

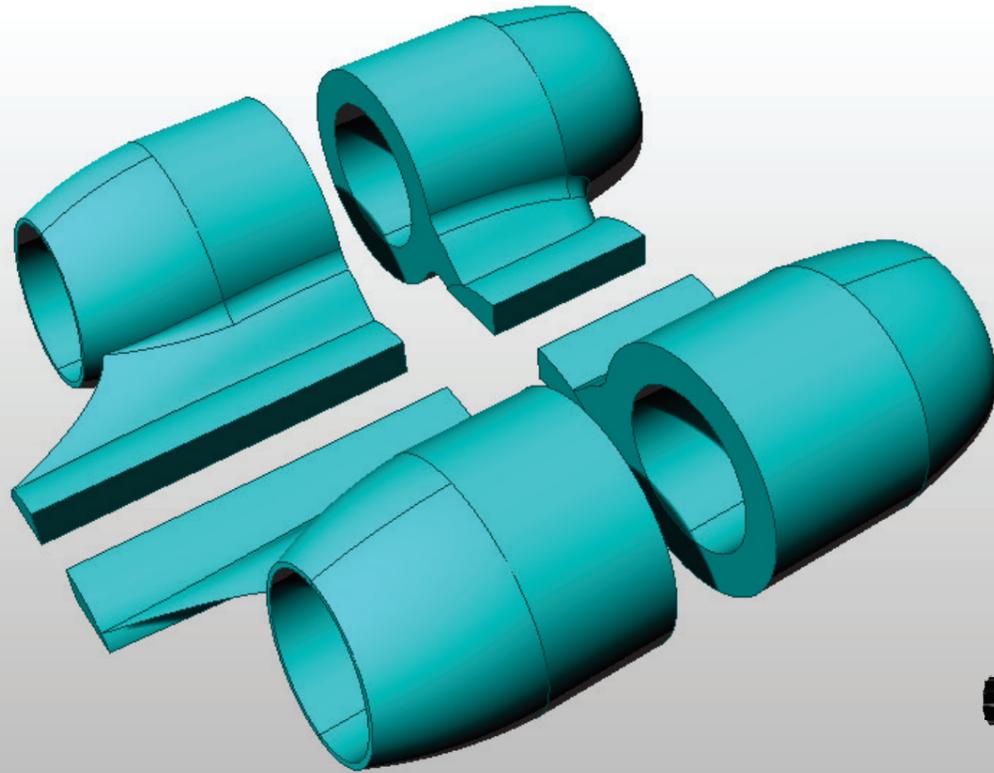
Glue the printed parts together with UHU por.

Run the cables through the cable slot - you may want to extend the cable length before you fix the EDF's in place.



Single Pusher only

3D printed



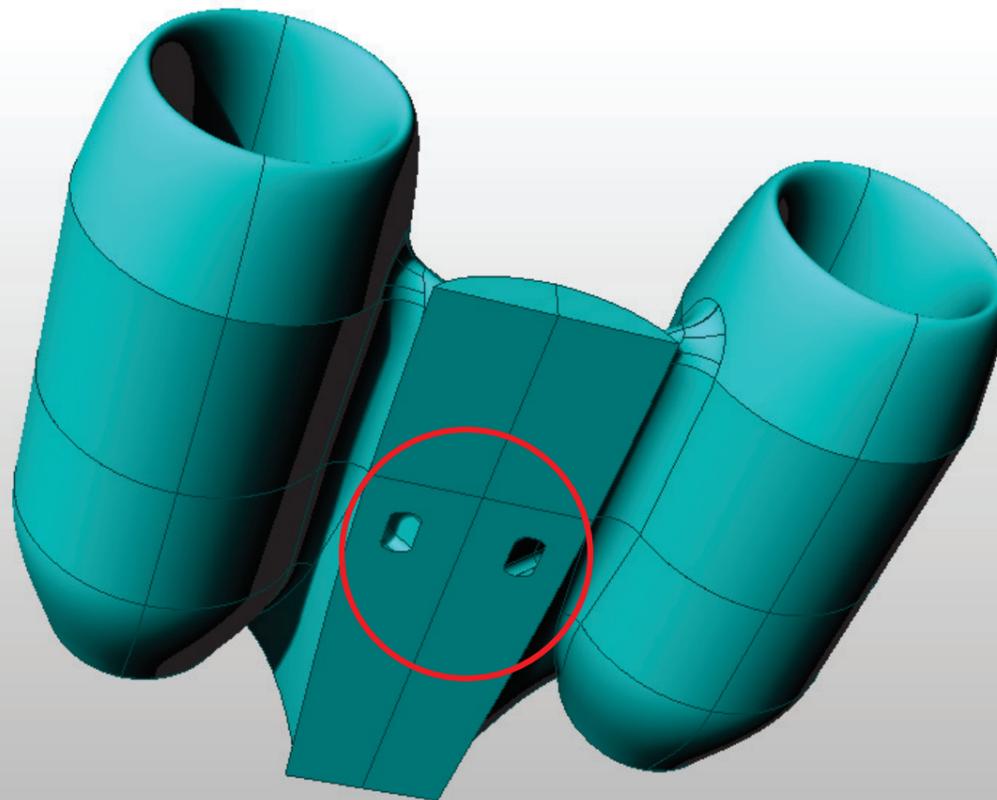
**3D
Printed
Part**
(optional)



For the tail pusher version - simply glue the nacelle parts together using UHU por.

Twin EDF only

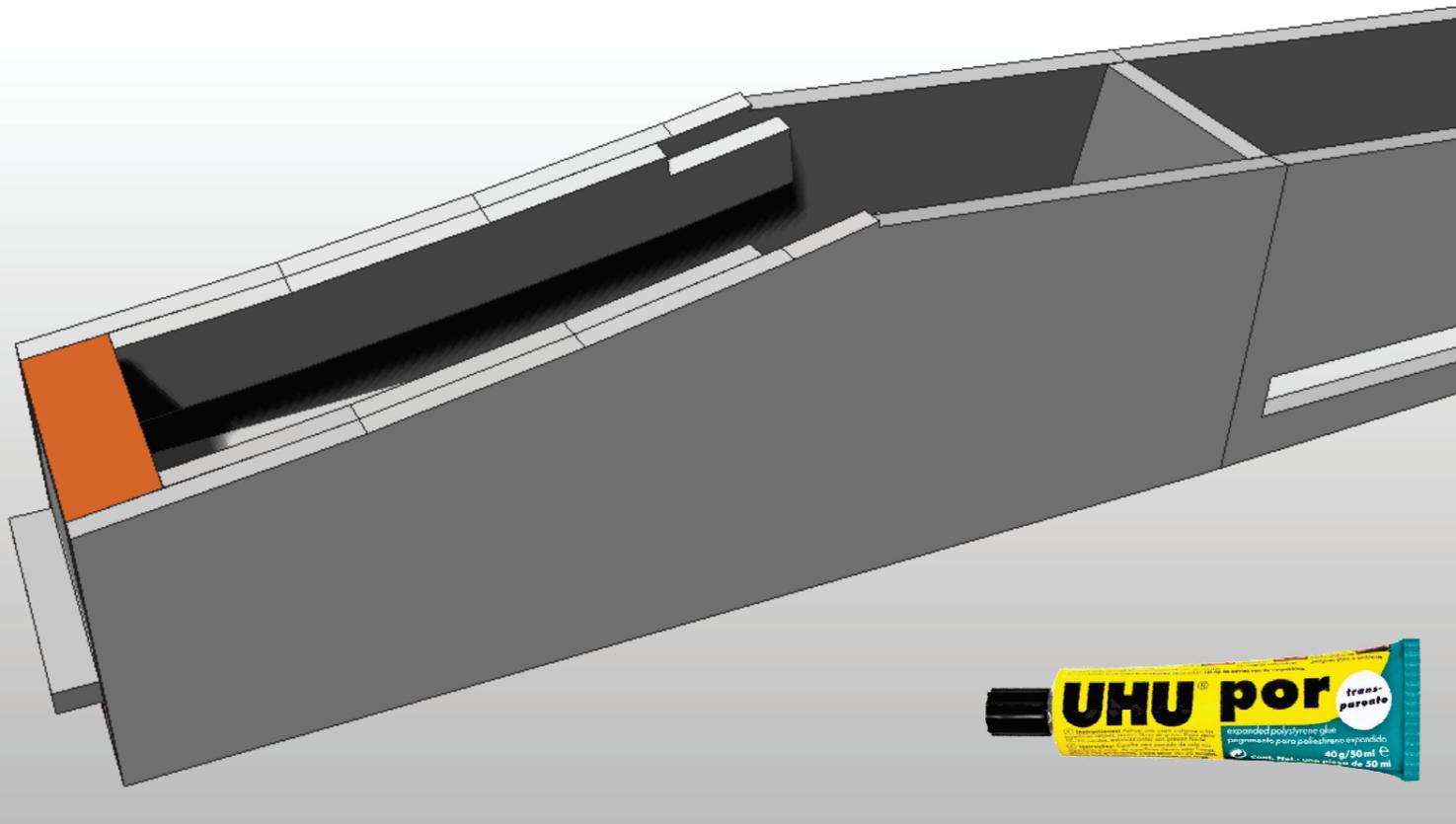
3D printed



Run the motor cables through the channels cut for them.

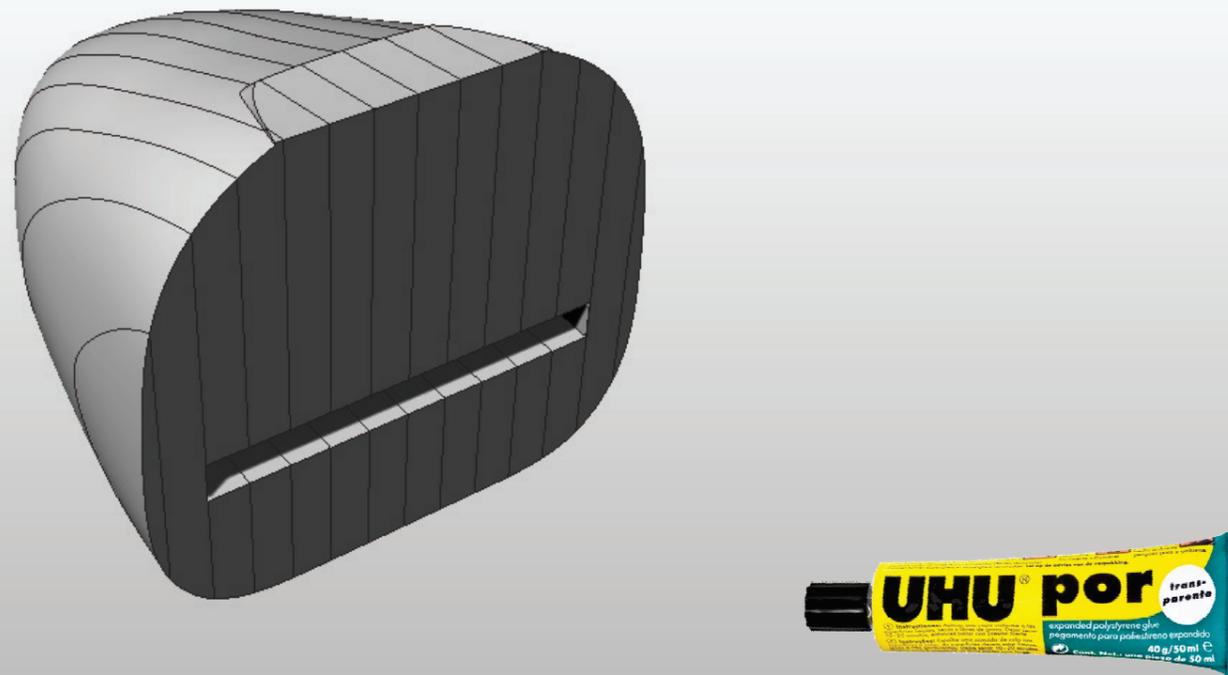


All versions



Glue the forward canopy support to the assembly.

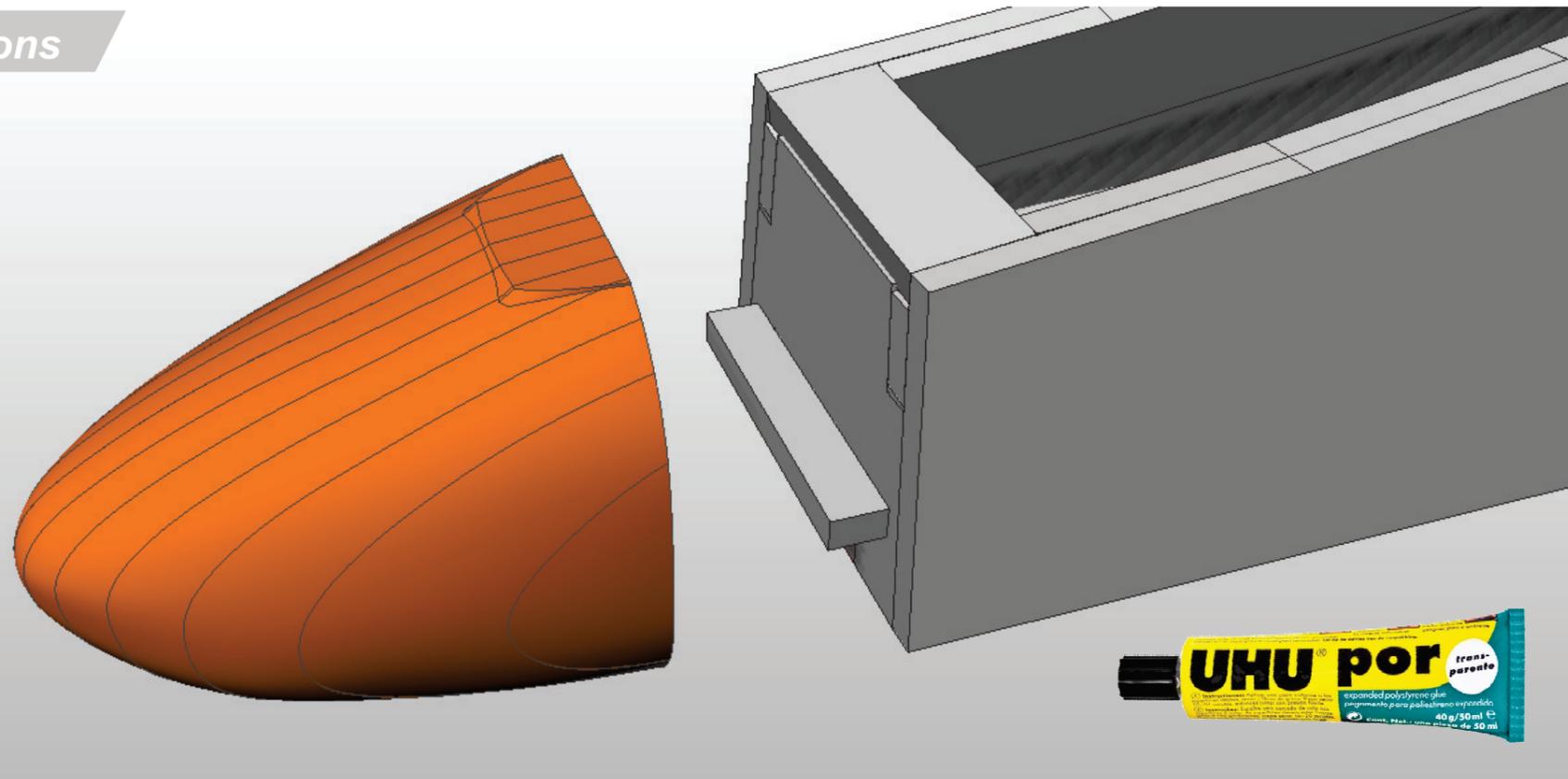
All versions



Laminate all the pieces of the nosecone together. Sand to shape.



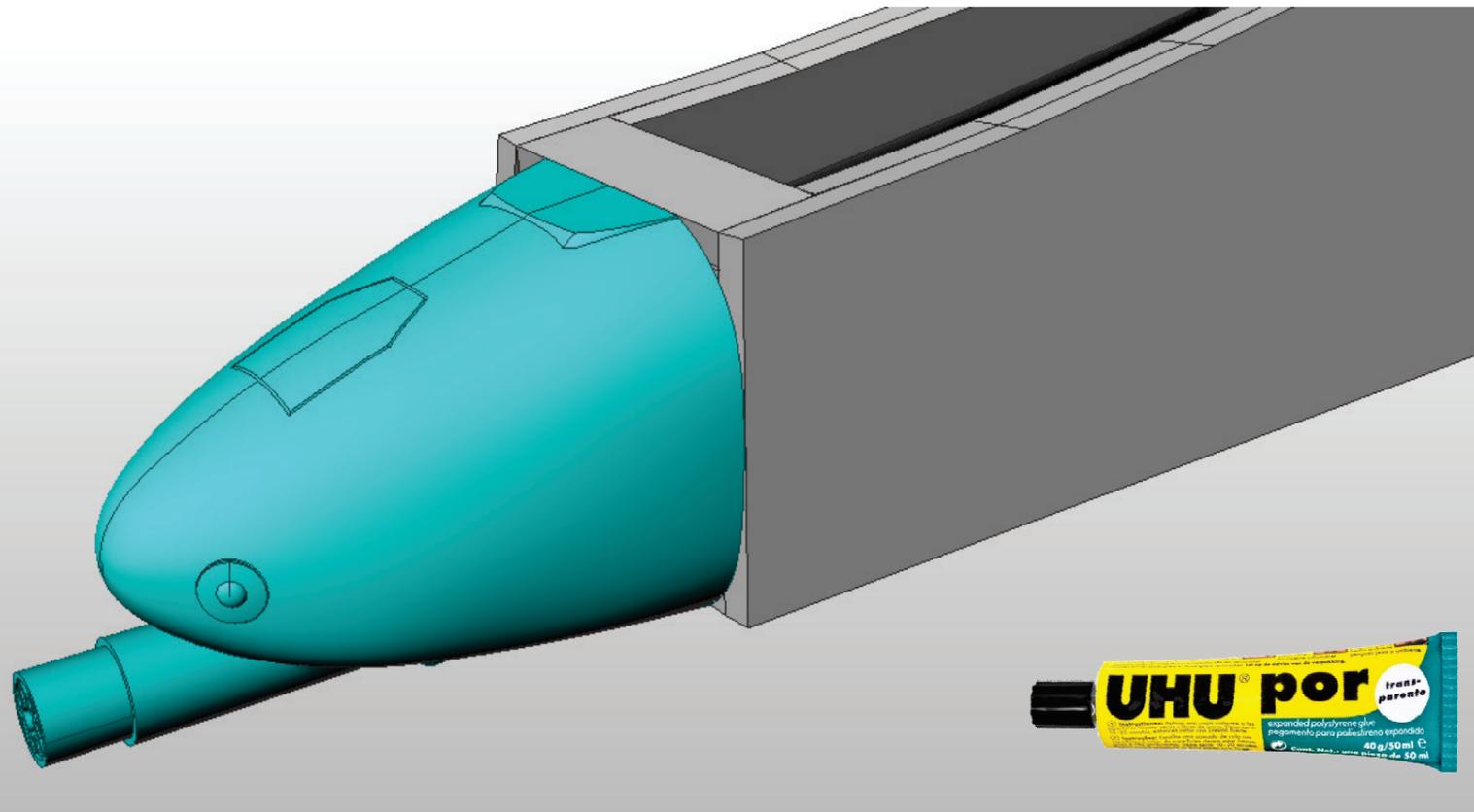
All versions



Glue the nosecone to the assembly using the nosecone aligner to locate it.

All versions

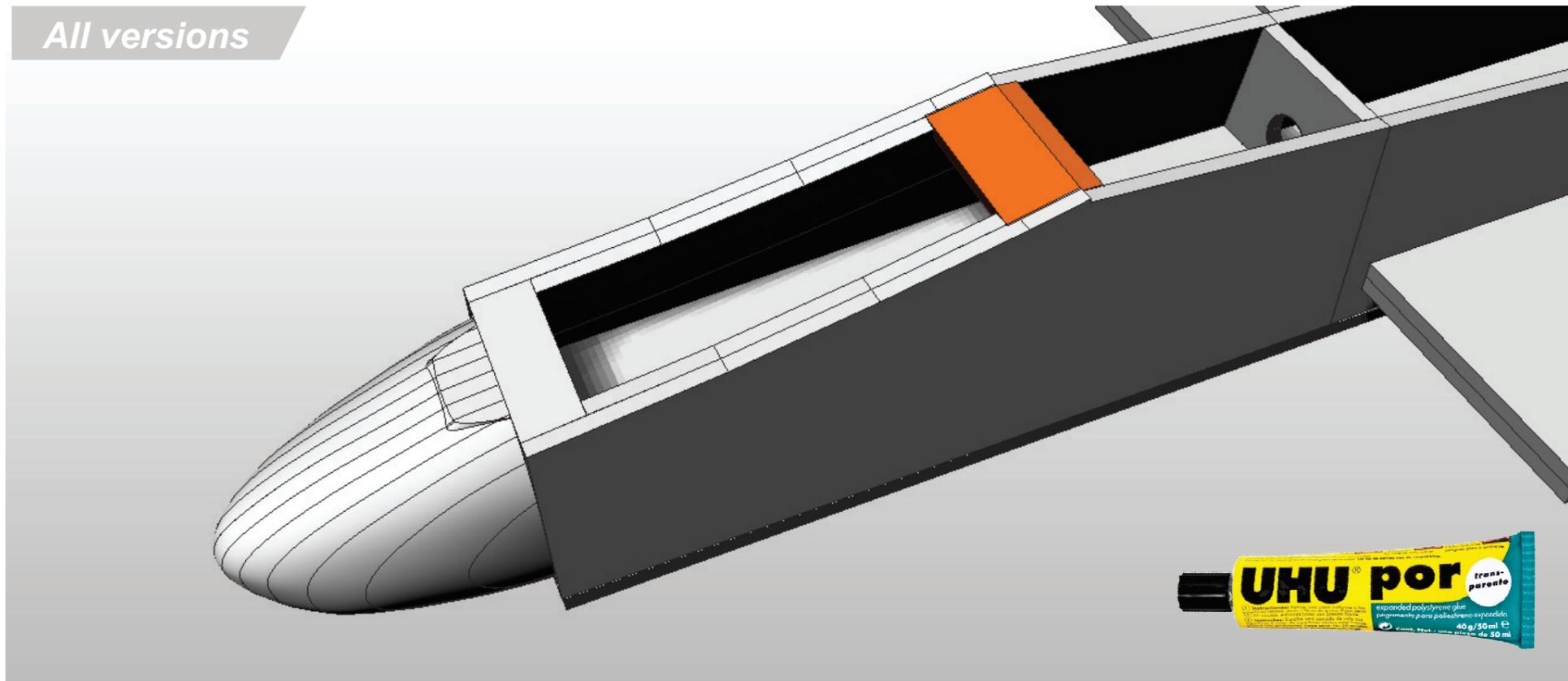
**3D
Printed
Part**
(optional)



Alternatively, print the 3D printed nosecone and glue to the assembly using the nosecone aligner to locate it.

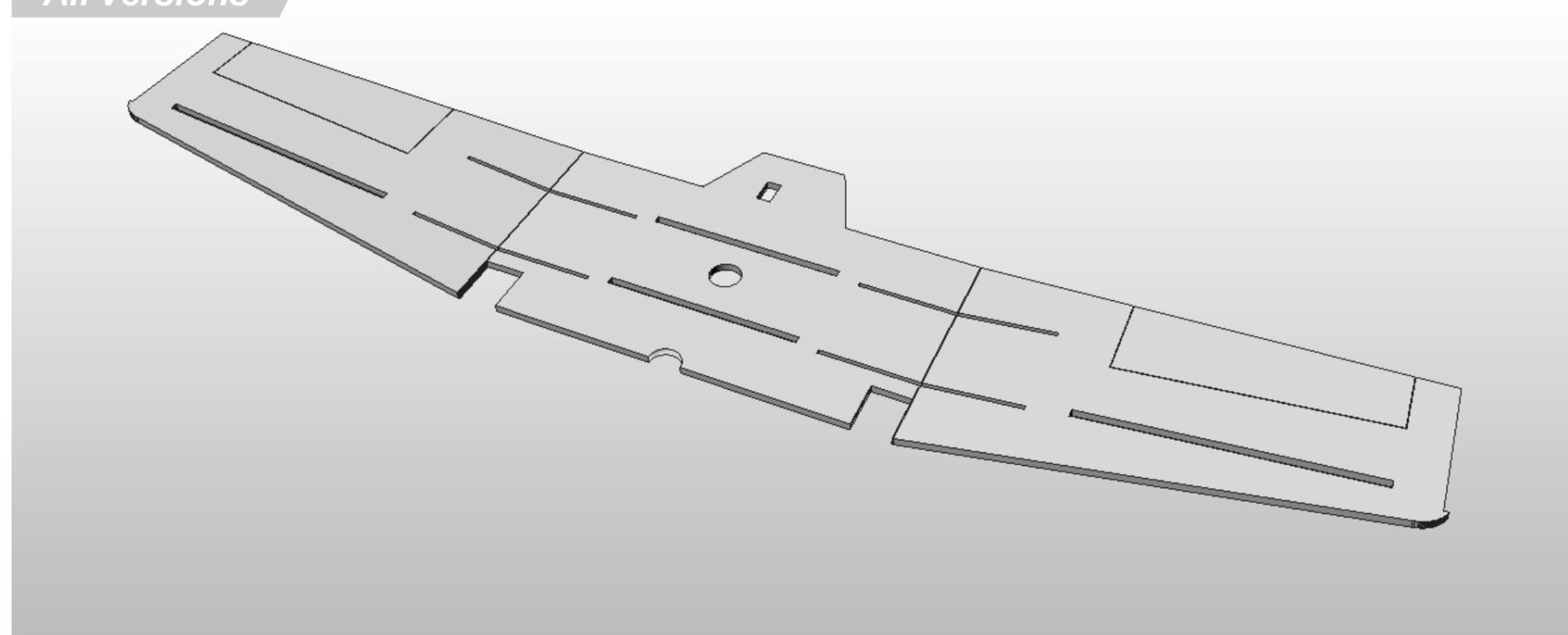


All versions



Glue the **Canopy Magnet support** panel to the assembly.

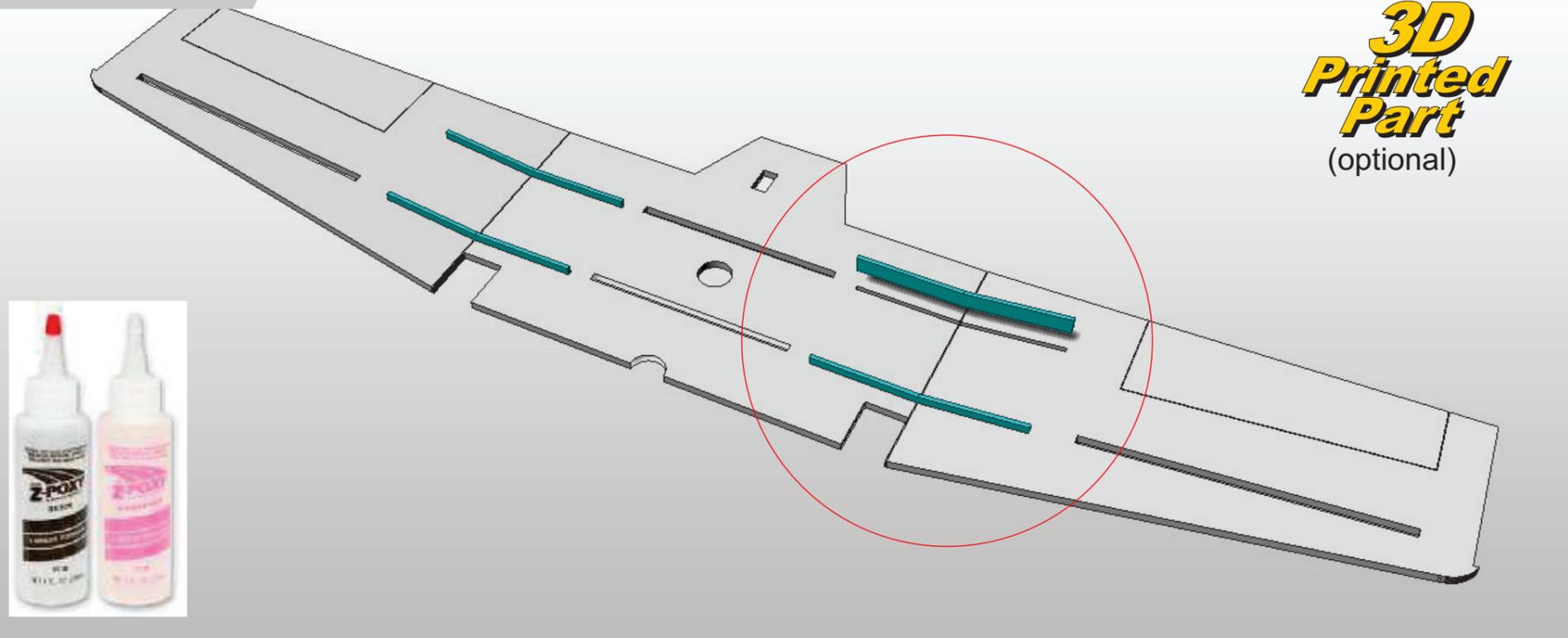
All versions



Carefully crush bend the **Lower wing piece** so that the wing crank is the same angle as the **wing spars**.



All versions

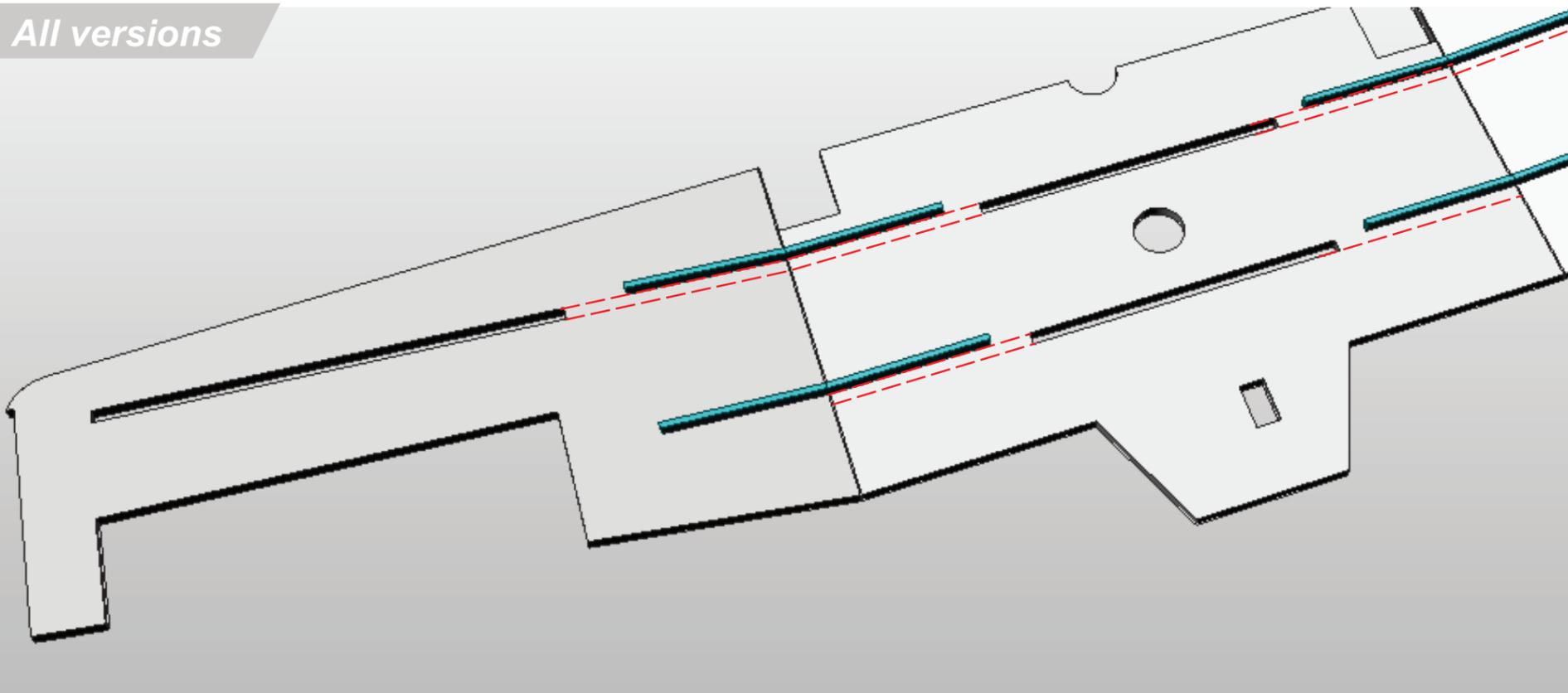


Glue the four cranked **Wing spars** in place using epoxy. These can be lite-ply or 3d printed plastic.

The bottom of the wing spar should be aligned flush with the underside of the wing, and protrude 6mm above the top of the wing.

The cranked wing spars will strengthen the wing crank, and support the depron for the next step.

All versions



Look ahead at the next few stages....

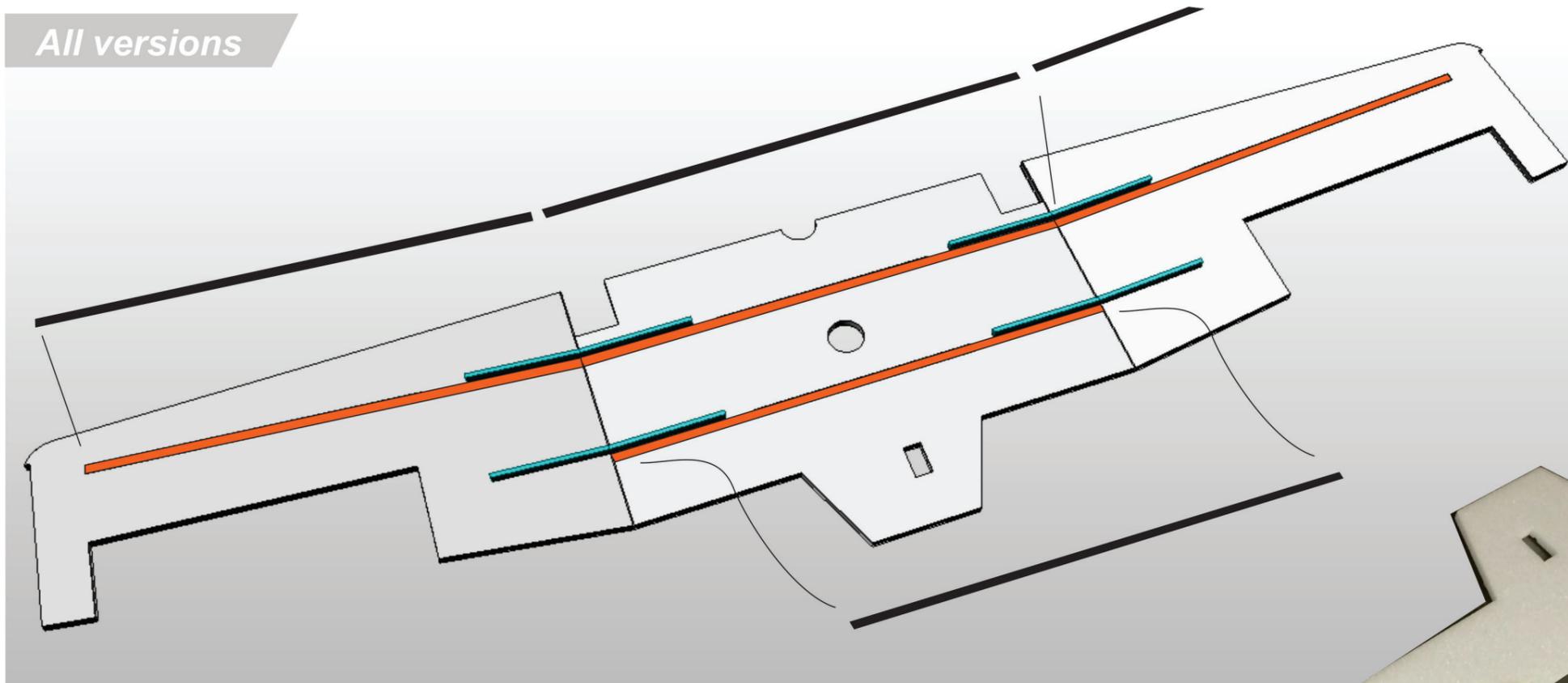
Using a ruler, draw connecting lines between the slots.

Leaving the cranked Wing spars in place, use a sharp knife trim away the slots for the 6mm carbon spars to sit in. The slots for the carbon should sit right against them - see image.

You may wish to do this stage and the next few stages in smaller steps to keep the rigidity of the wing.



All versions

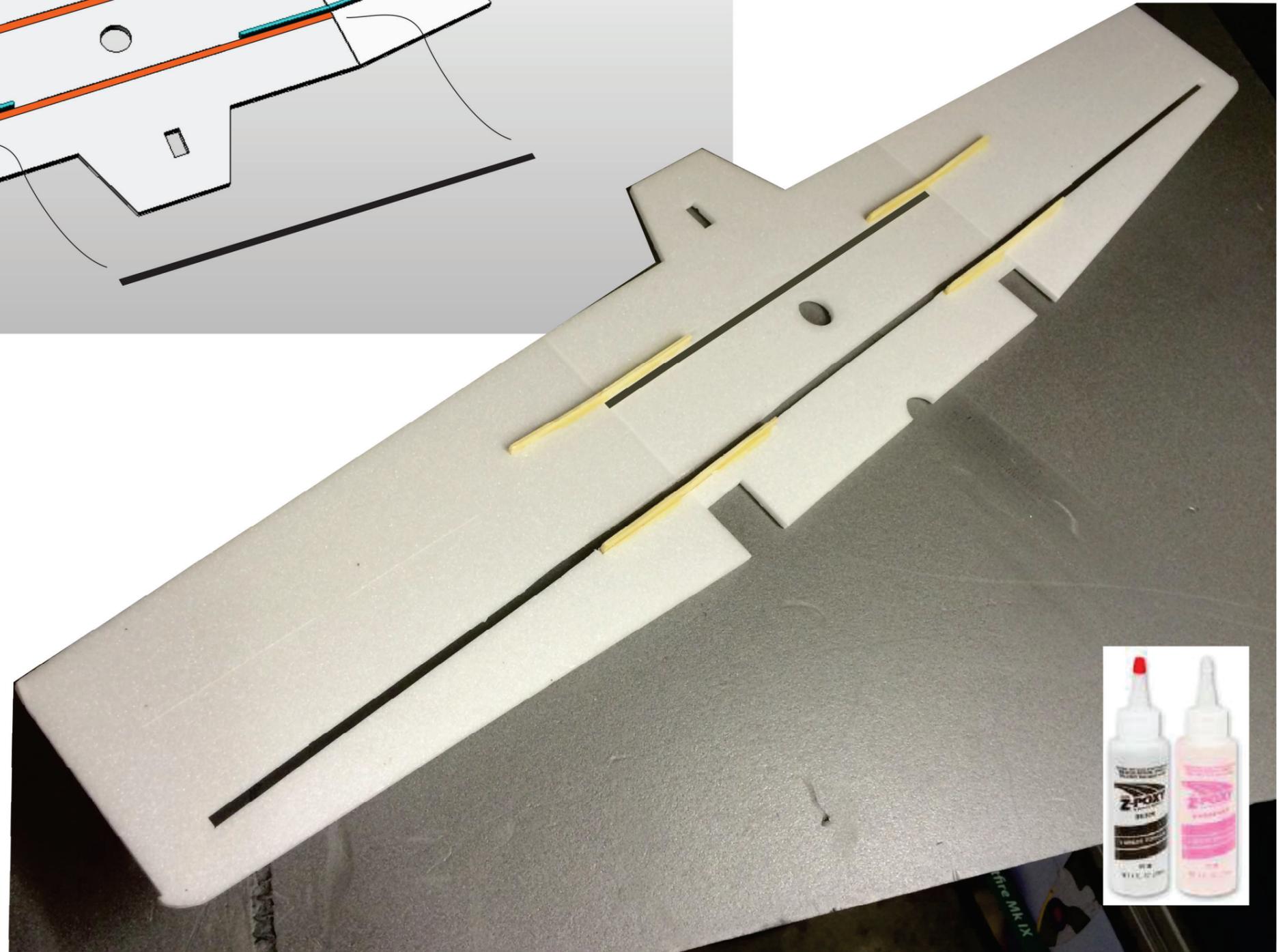


Cut and glue the four 6mm carbon spars into the wing.

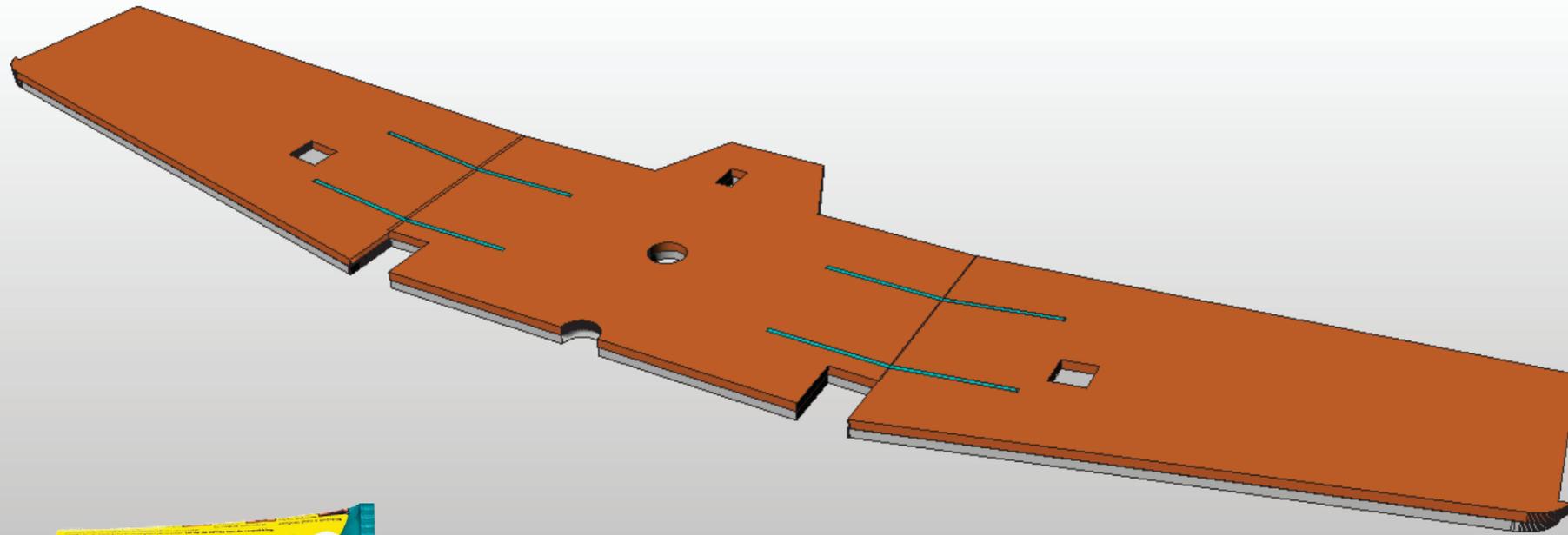
IMPORTANT

Make sure the carbon spars are glued to the side of the plywood/3d printed spars to give the wing its strength.

The photo opposite is how your wing should look when complete.

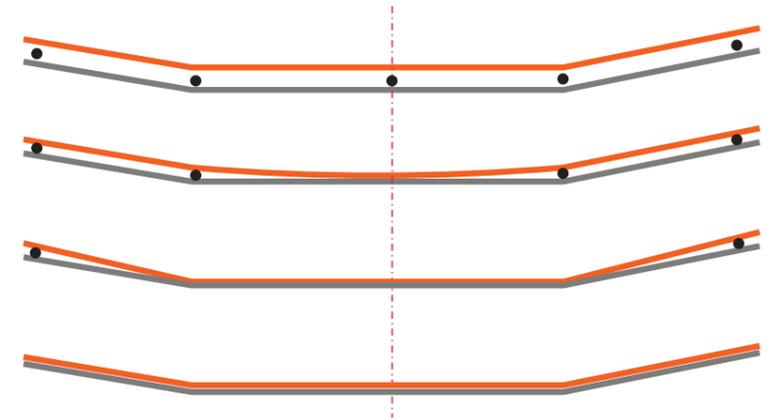


All versions

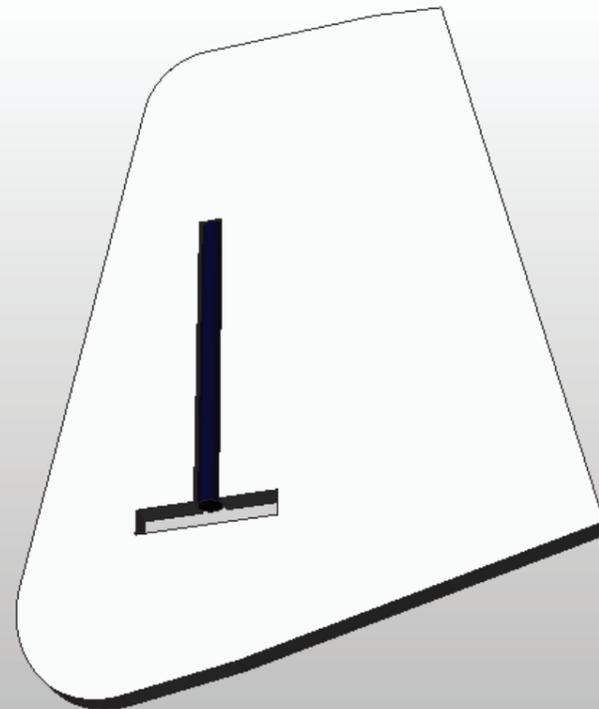


Coat both surfaces with UHU Por and carefully stick together.

I suggest that you use pencils to hold the glued wings apart while you align them. Start at the centre and work outwards.



All versions

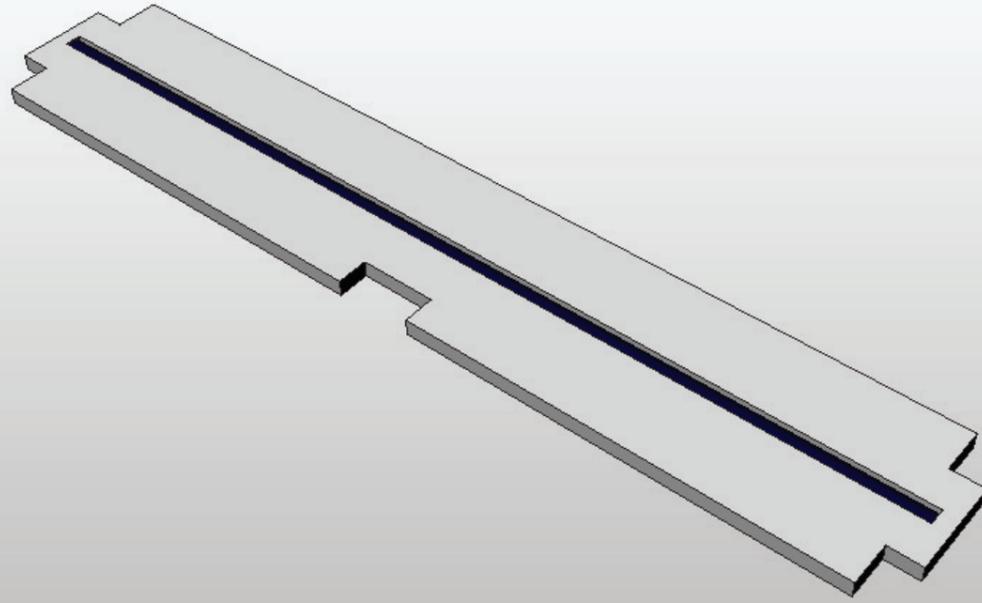


glue the 6mm carbon spar into both vertical stabilisers.

Use masking tape to contain the epoxy and give a smooth finish.



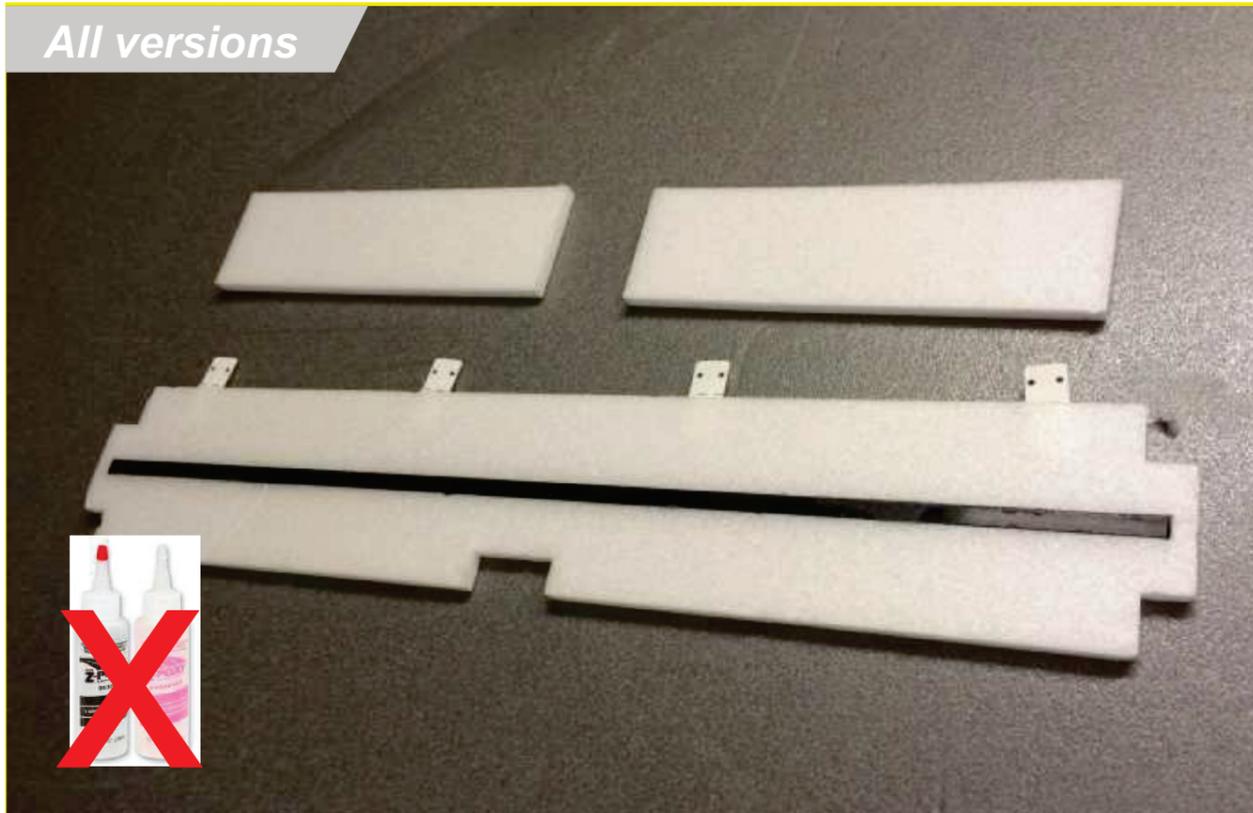
All versions



Glue the 6mm carbon spar into the horizontal stabiliser.

Use masking tape to contain the epoxy and give a smooth finish.

All versions



Dry fit the elevators and elevator hinges. Do not glue at this stage.

I like to use graupner mini hinges.



All versions

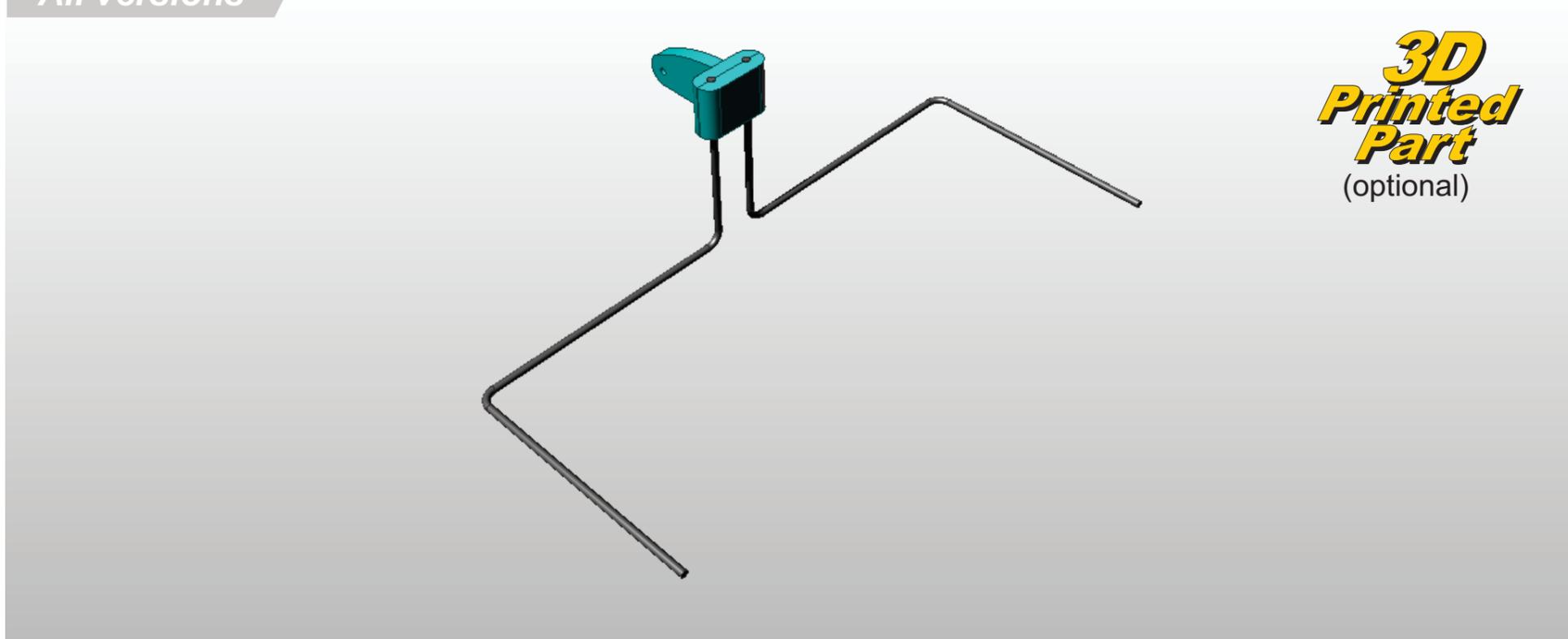


Bend 0.5mm piano wire into shape, Remove a brass ball from a ball & socket joint, and solder the two ends into the hole in the ball.

You may need to file the piano wire a little to get them to fit.

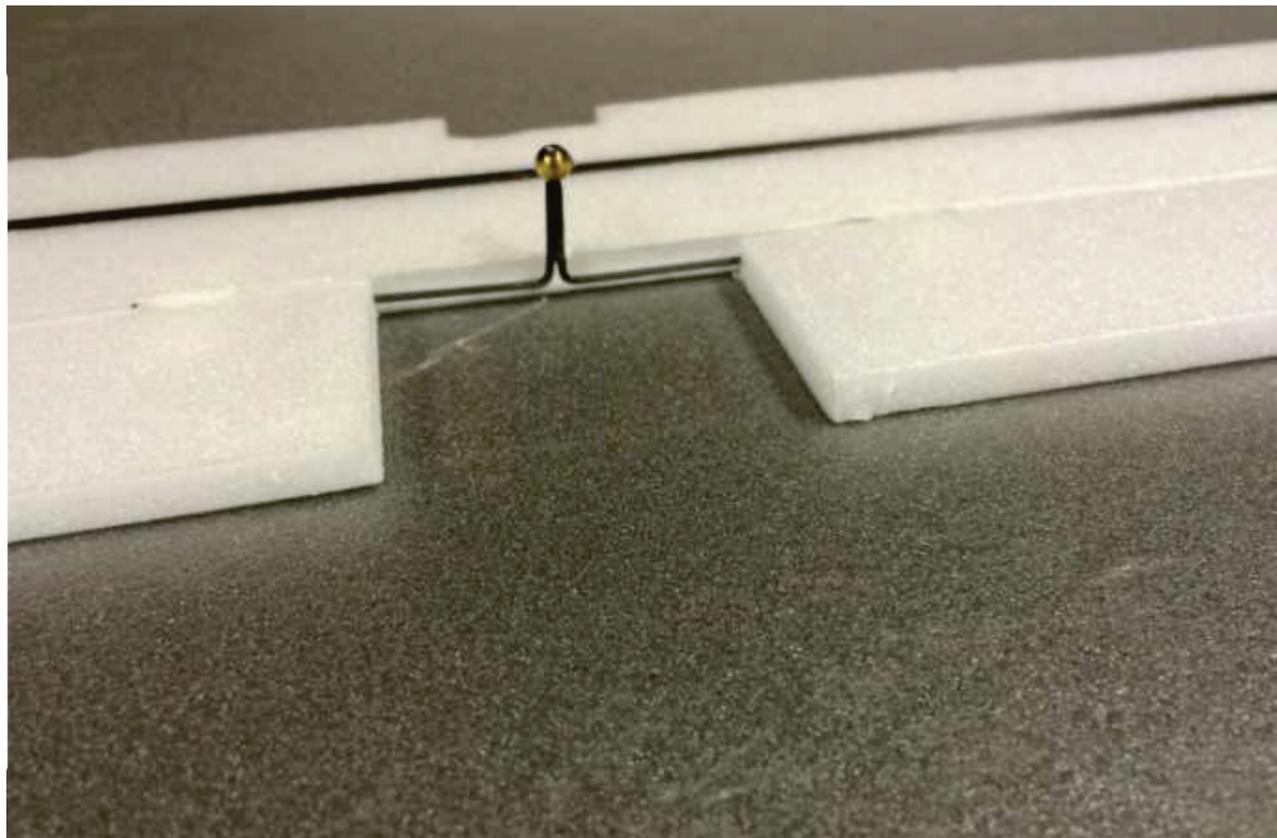
Use wet-n-dry to rub away any excess solder.

All versions

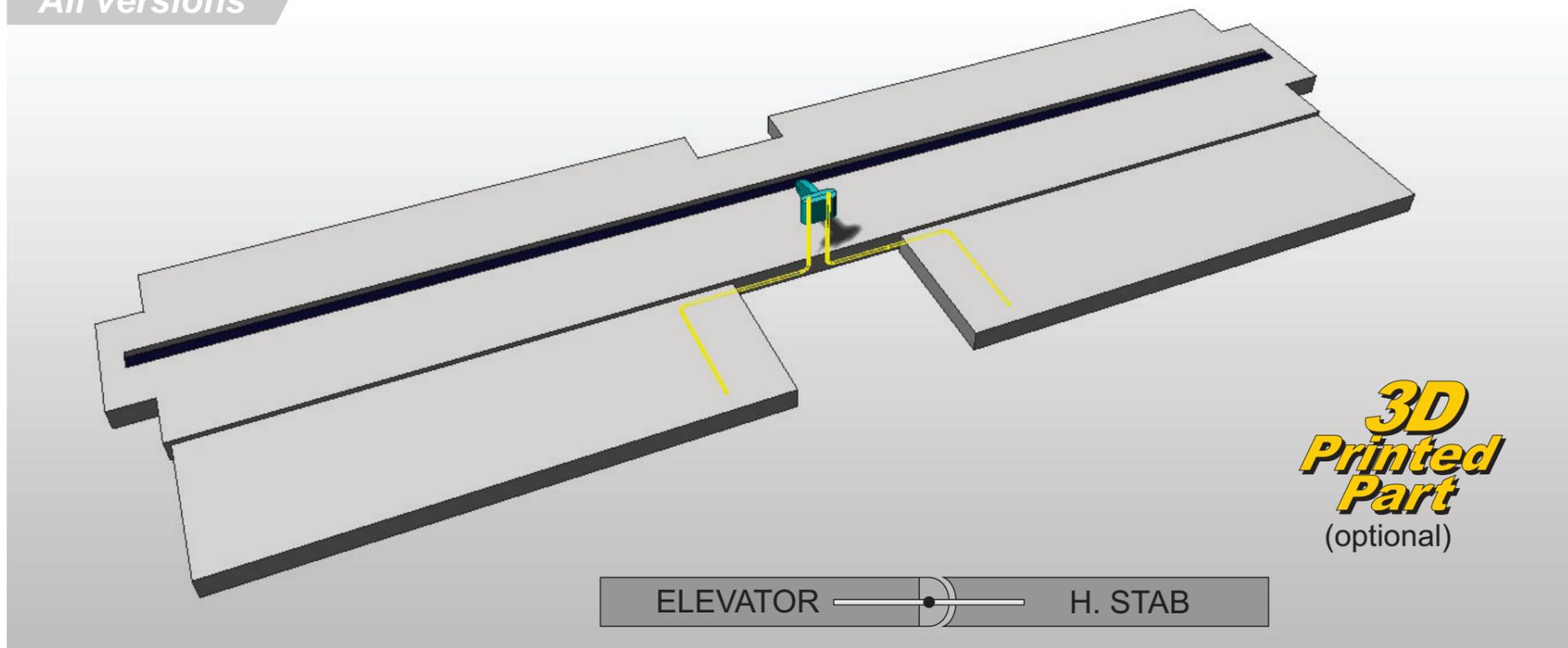


Alternatively 3d print this connector, Bend 0.5mm piano wire into shape and glue together using epoxy.





All versions



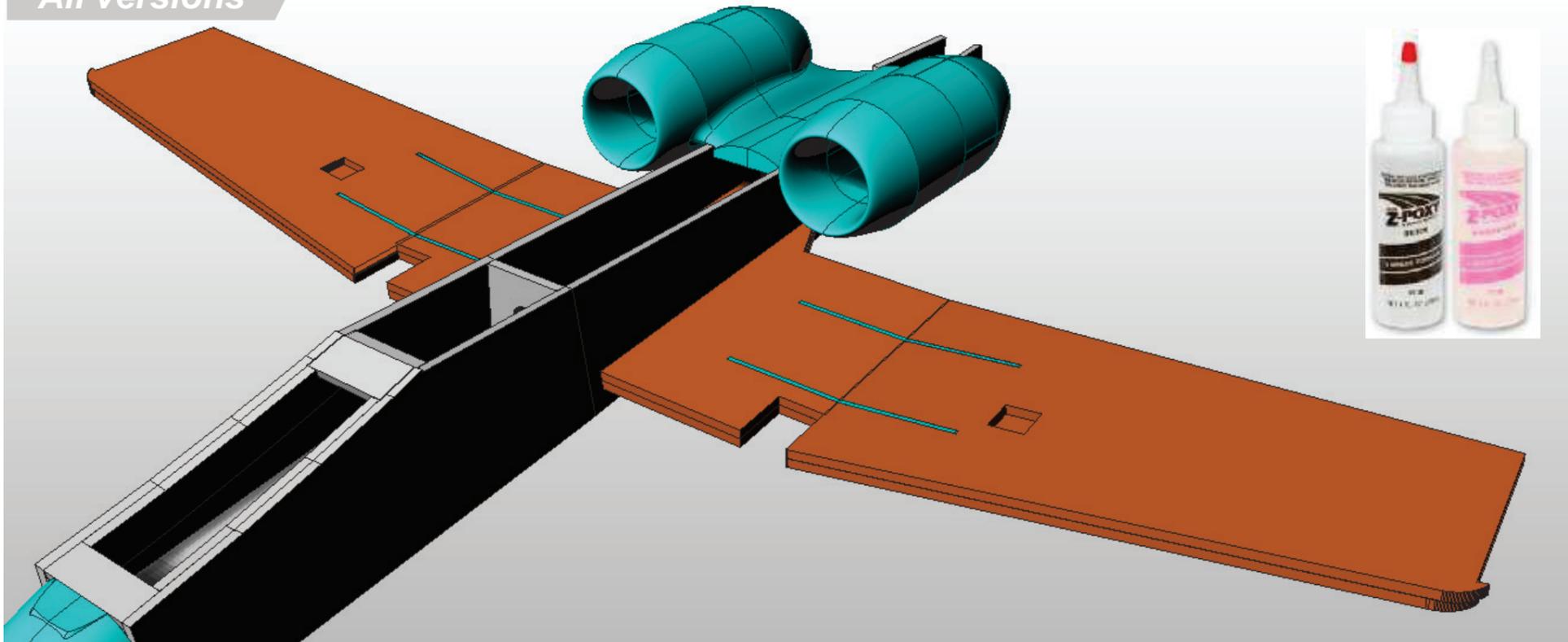
Sand a semi-circular leading edge on the elevators. Cut away a recess for the hinges to enable a clean movement.

Use a scrap piece of 6mm tube to shape a concave trailing edge to the horizontal stabiliser - in order to get a nice fit with the elevators.

Glue the piano-wire control arm into the elevators and then glue the elevators to the horizontal stabiliser.



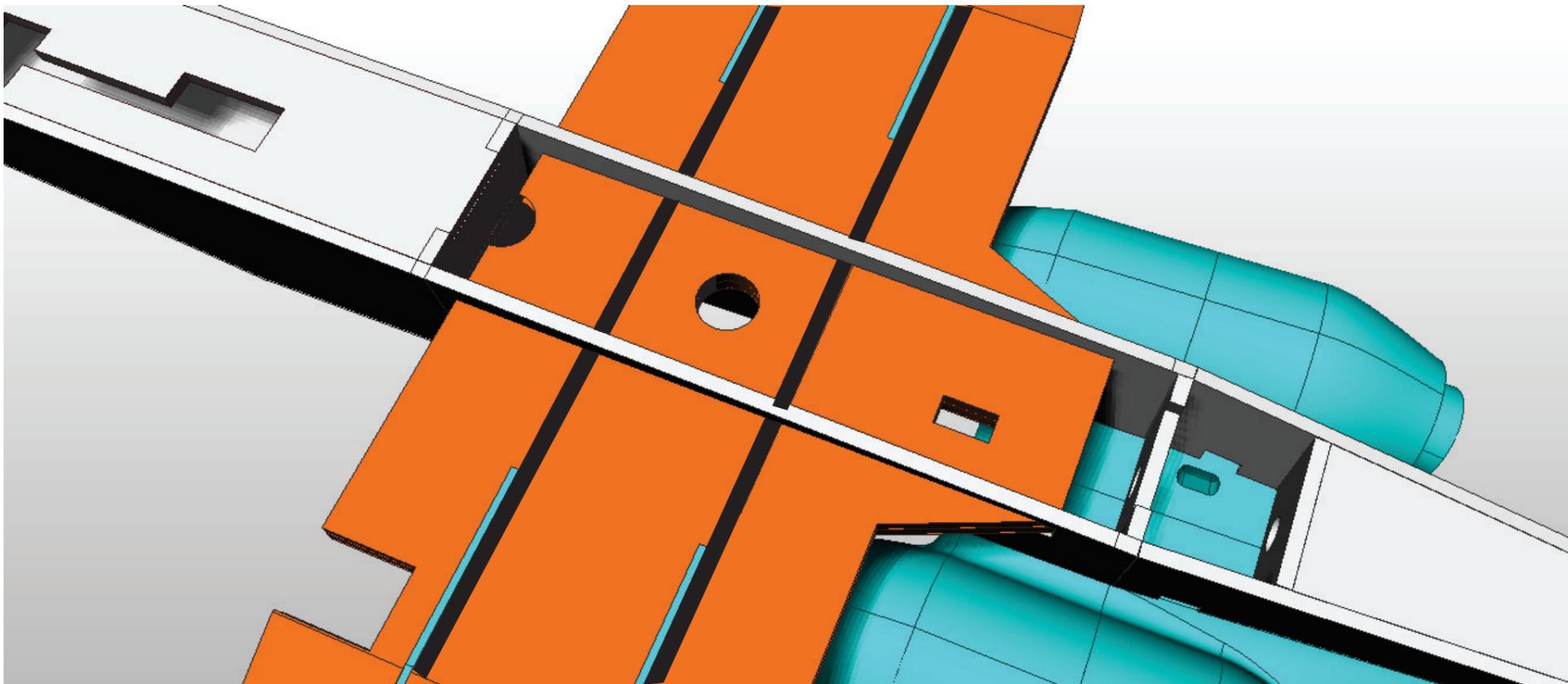
All versions



Slide the wing assembly into the fuselage. Orientate correctly, mark its position on the wings with a pencil.

Slide out of centre, apply epoxy to the areas that will be in contact when correctly aligned.

Slide the wing back into place. Wipe off excess glue.



View from underneath.

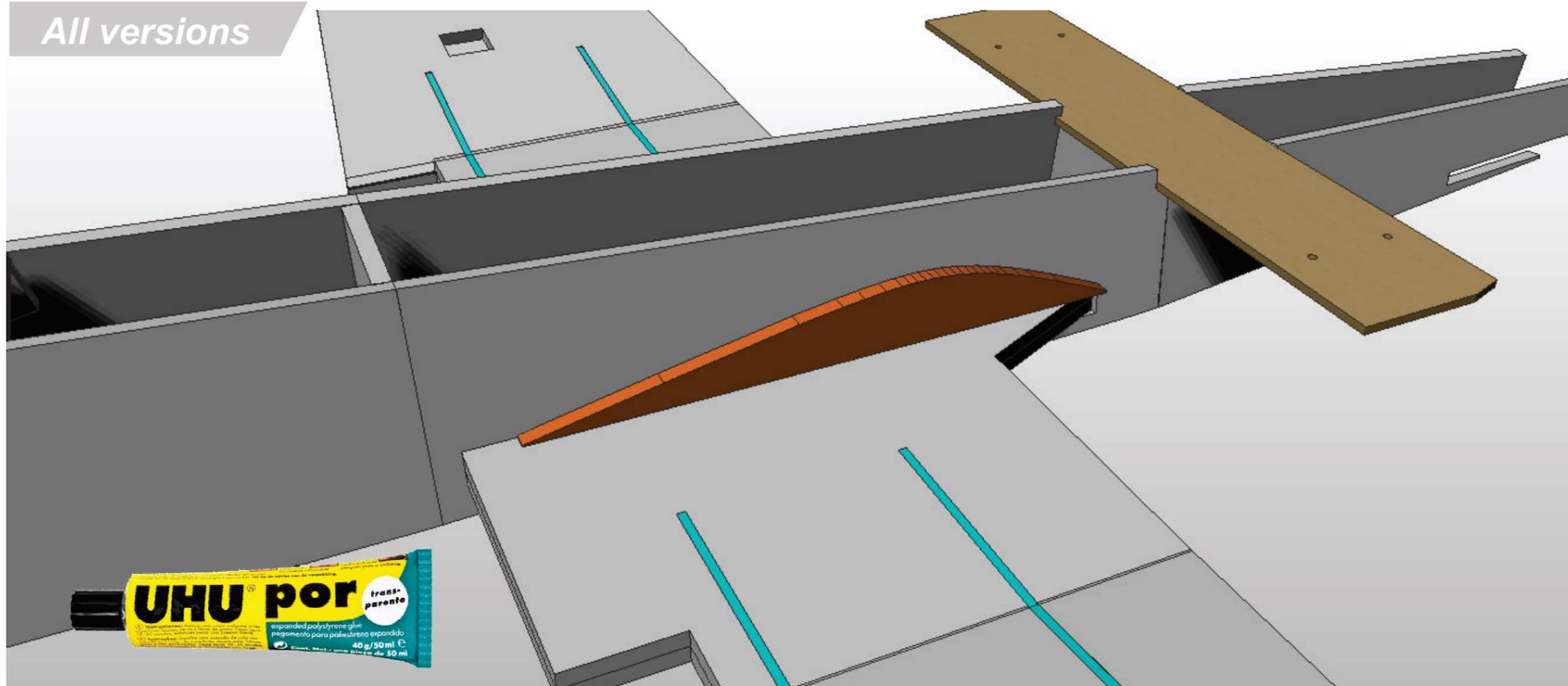


All versions



Sand the **Wing supports** to shape.

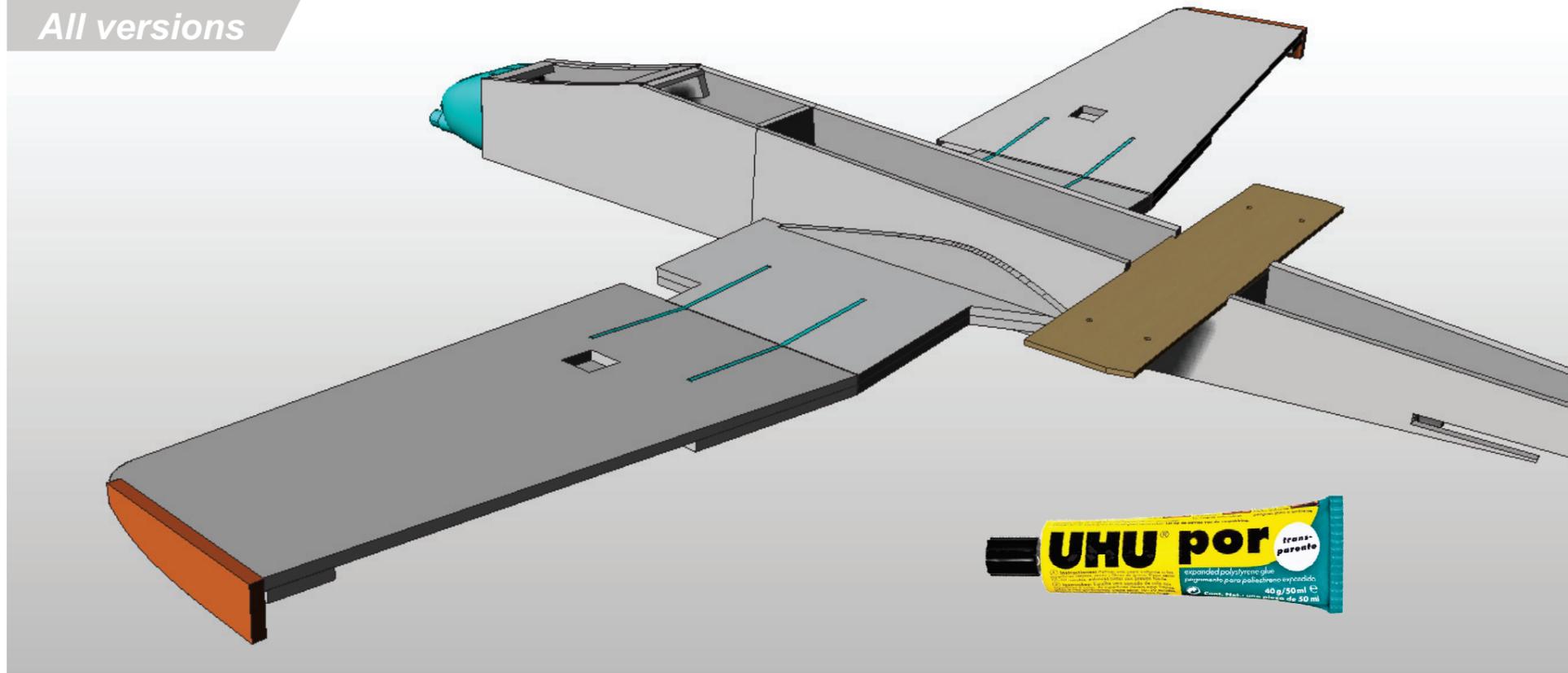
All versions



Glue the wing supports to the intersection between the fuselage and wing as shown.

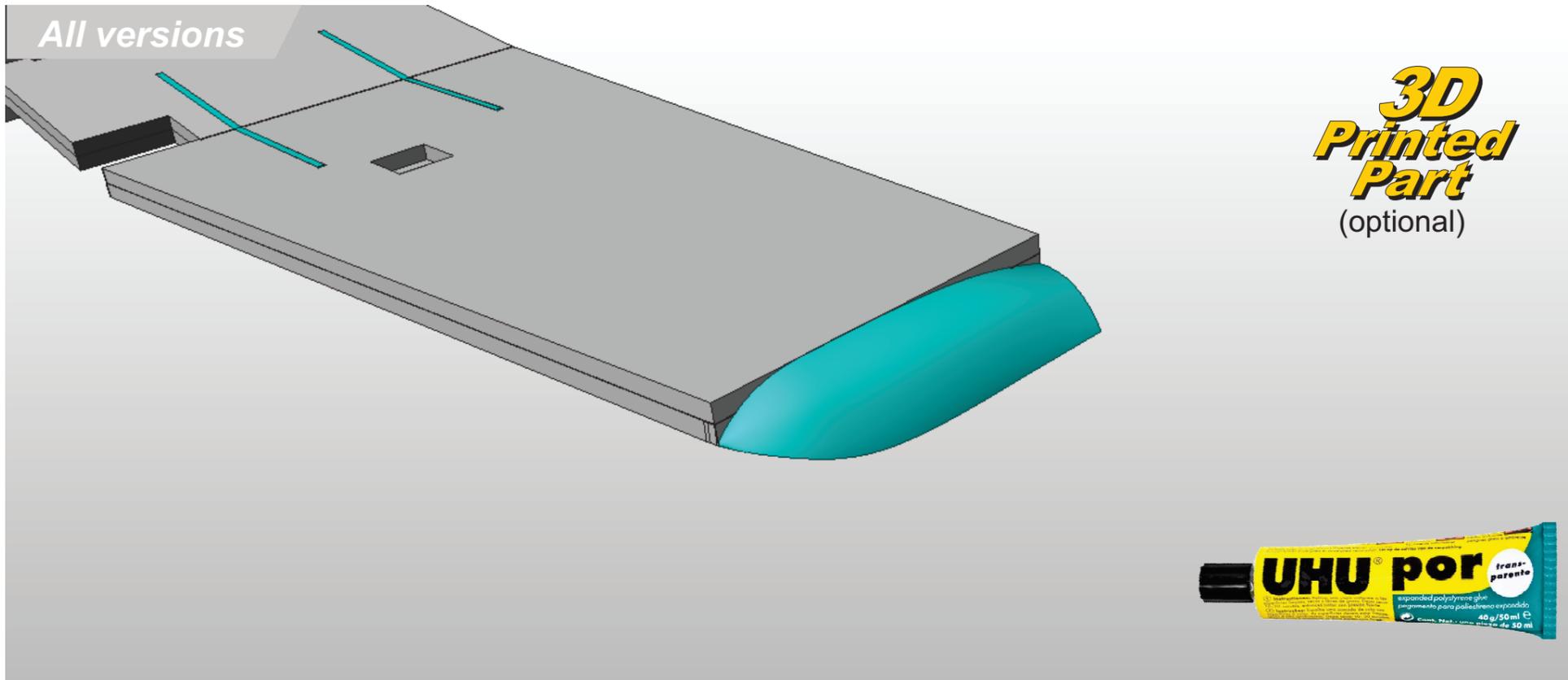


All versions

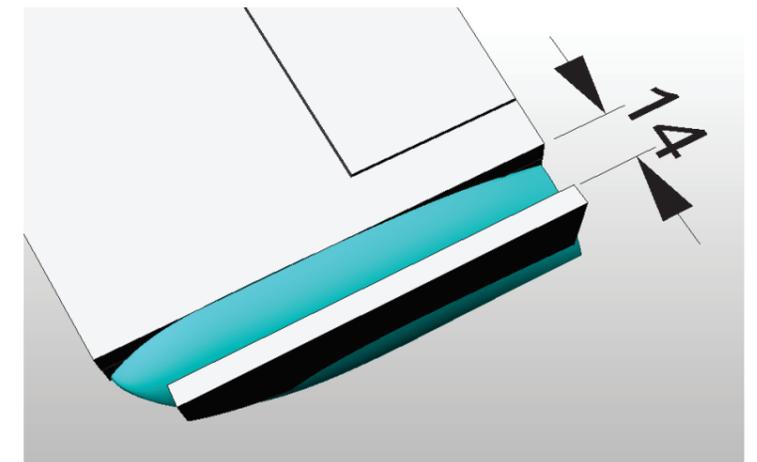


Glue the winglets to the wing-tips as shown. Sand to shape to represent the real plane.

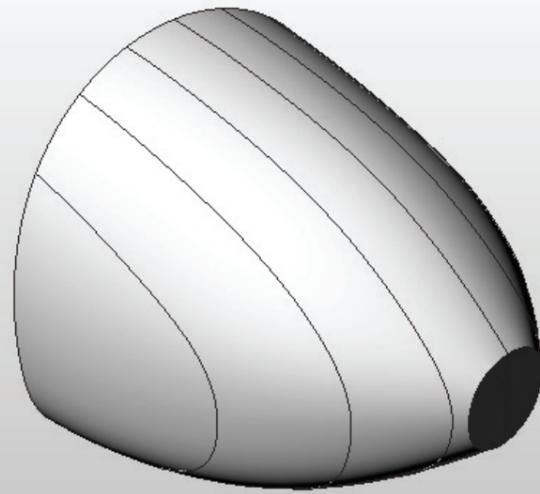
All versions



Alternatively, trim back the wing 14mm and glue on the 3d printed winglets.

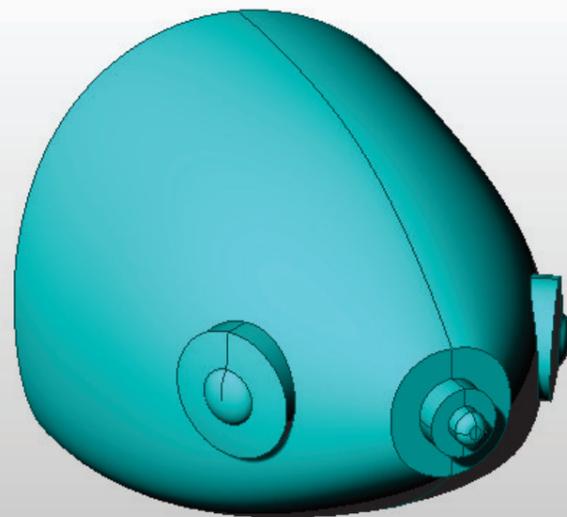


All versions



Laminate the tail cone pieces together

All versions

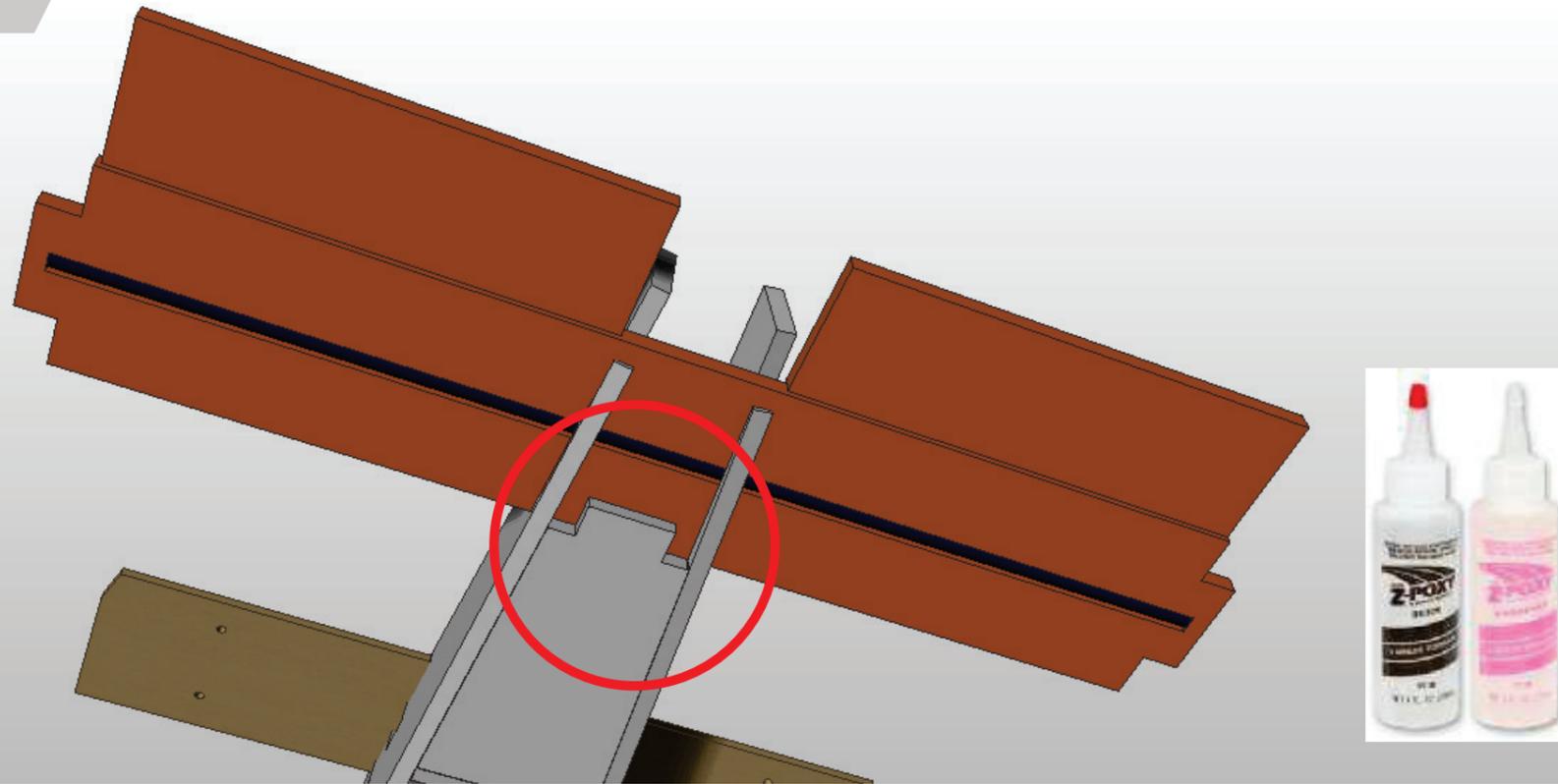


**3D
Printed
Part**
(optional)

Alternatively you can 3D print a nosecone.



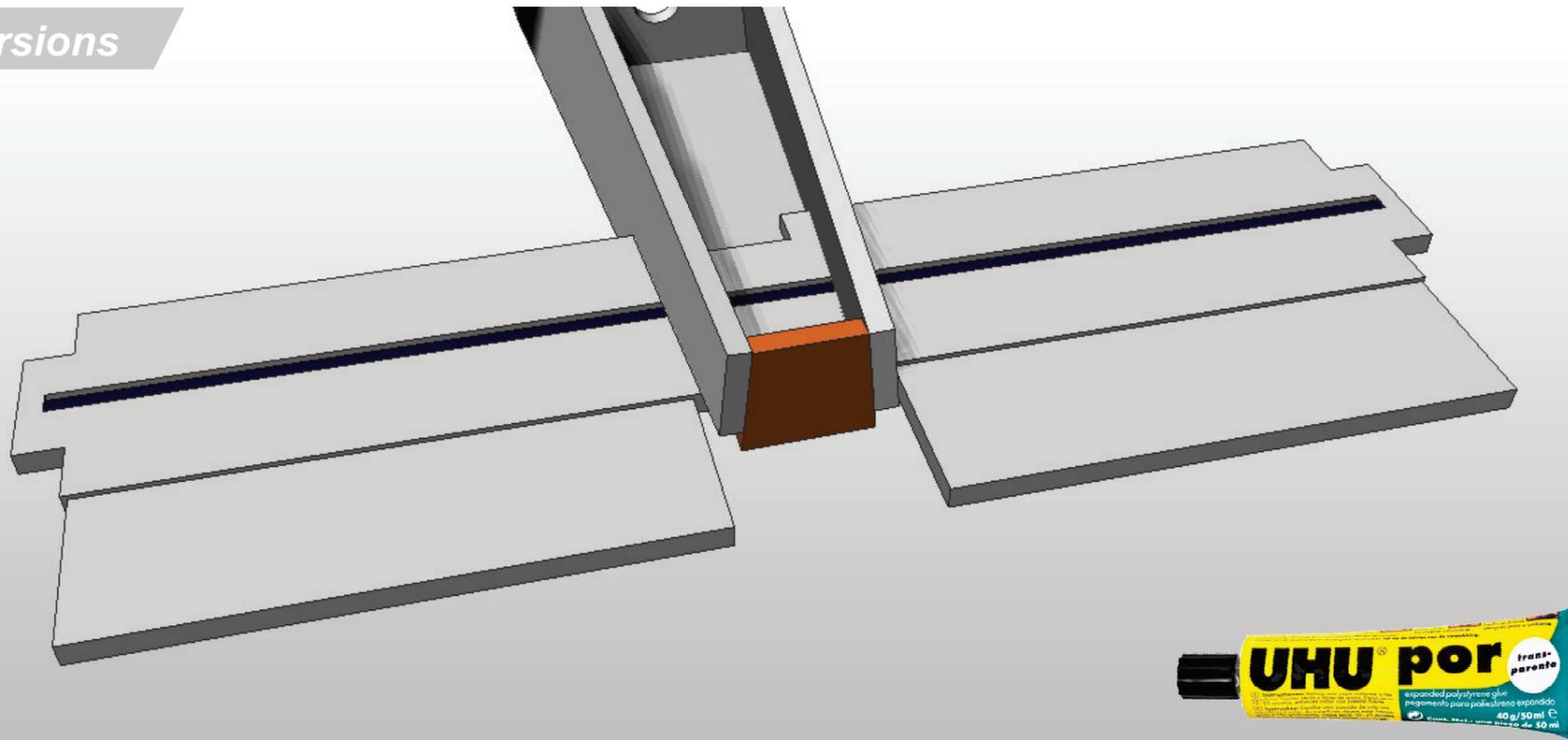
All versions



Epoxy the horizontal stabiliser assembly onto the fuselage. Use the tab to achieve correct alignment.

In top view, ensure that the horizontal stabiliser is mounted 90 degrees to the centreline of the fuselage.

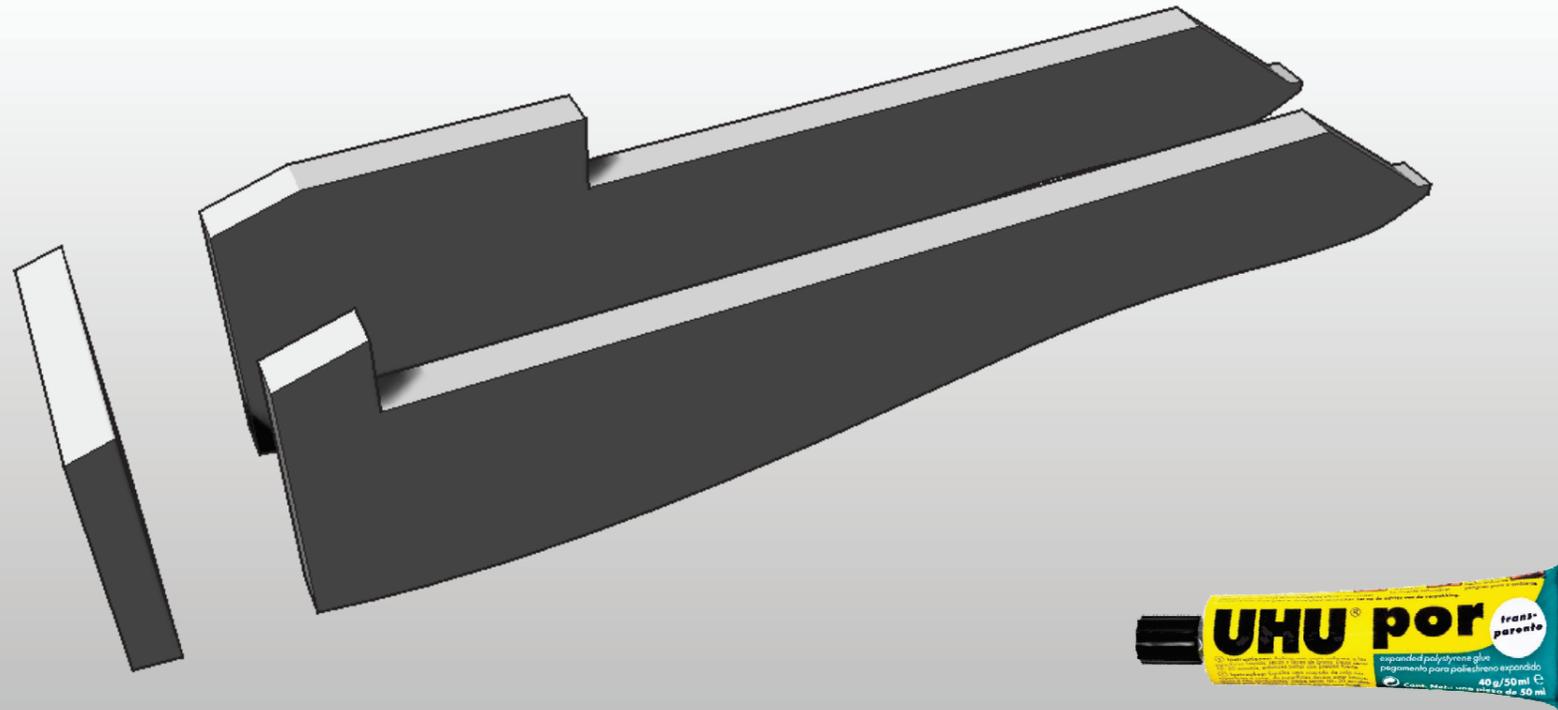
All versions



Glue **Bulkhead 5** in place. make a hole in it if required to elevator control horn clearance.



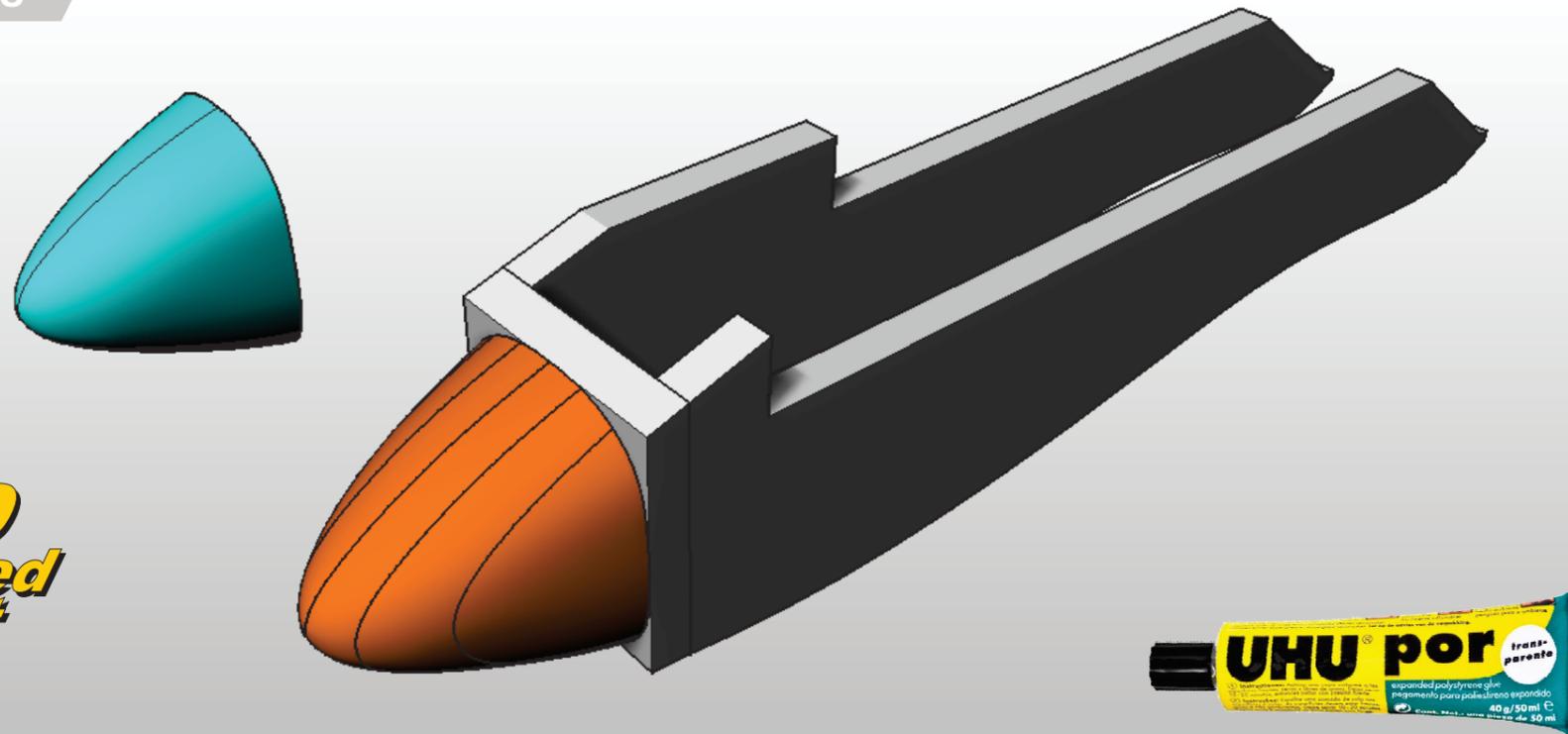
All versions



Glue the **Wing wheel shroud bulkhead** and the **Wing wheel inner and outer sides** together.

(make two mirrored assemblies)

All versions



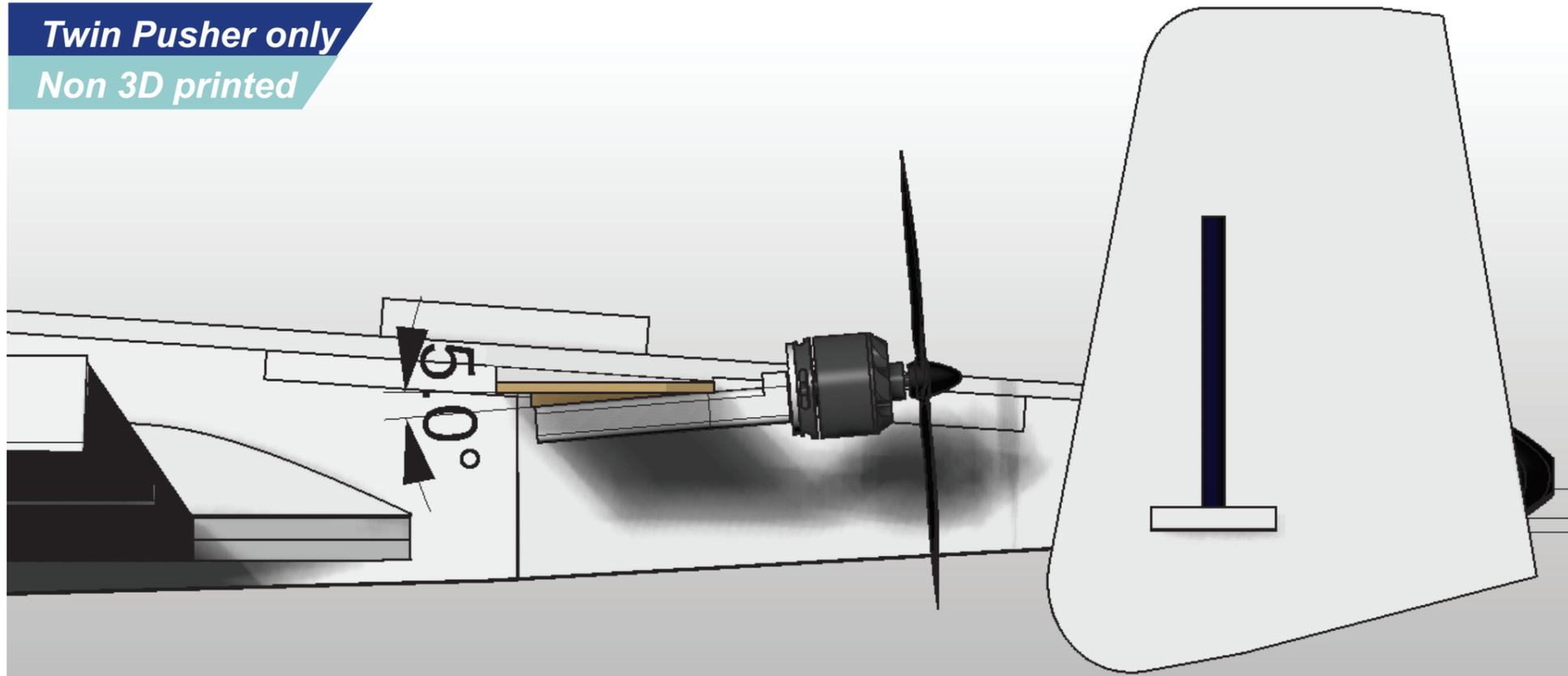
Laminate the Wheel shroud nosecone pieces together and then glue to the Wheel shroud assemblies.

Alternatively you can 3d-print nosecones



Twin Pusher only

Non 3D printed



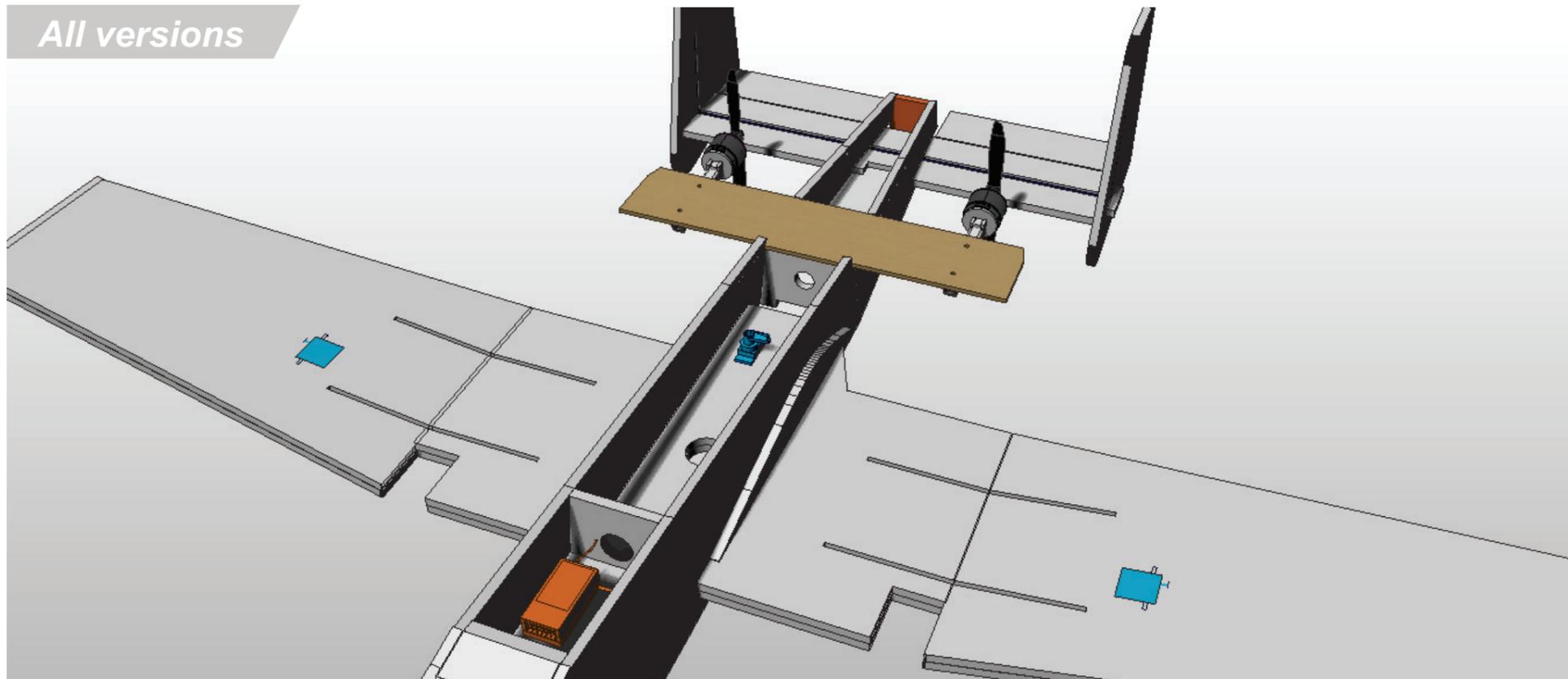
Create a wedge shaped piece of balsa that will incline the plastic stick mount 5 degrees, when mounted to the underside of the lite-ply motor mount spar.

Hobbyking - OR004- 00602

There are 3d print versions available - see website.



All versions

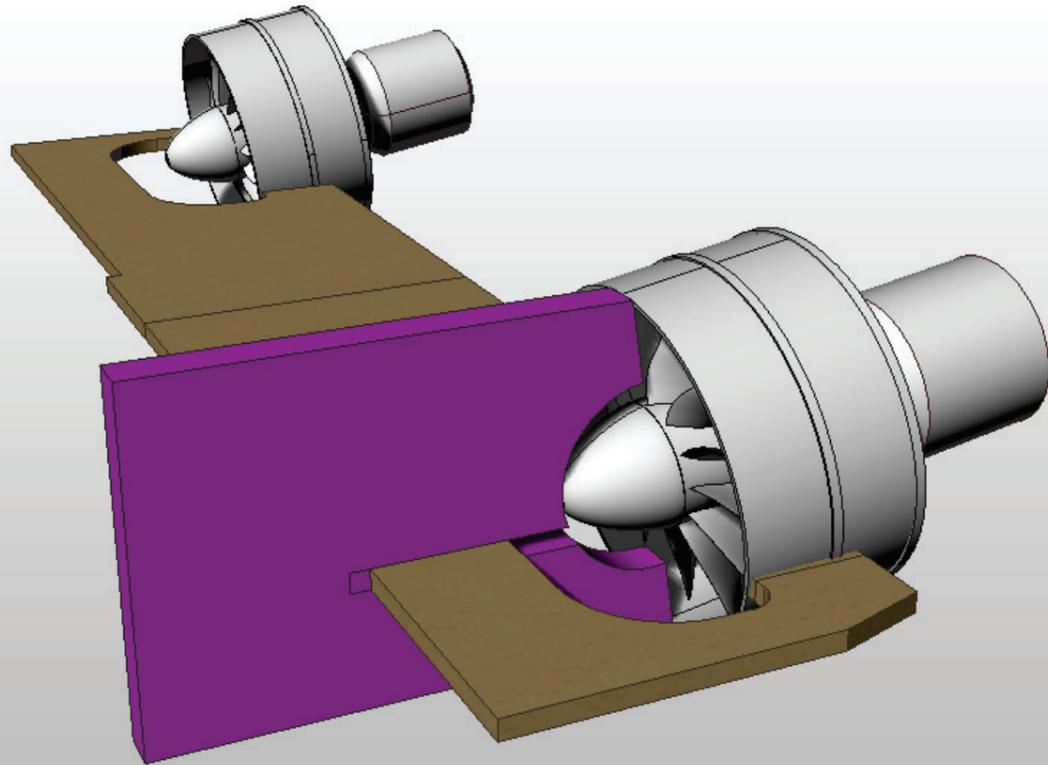


Using 3mm machine screws bolt the pusher stick mounts to the lite-ply motor mount spar.



Twin EDF only

Non 3D printed



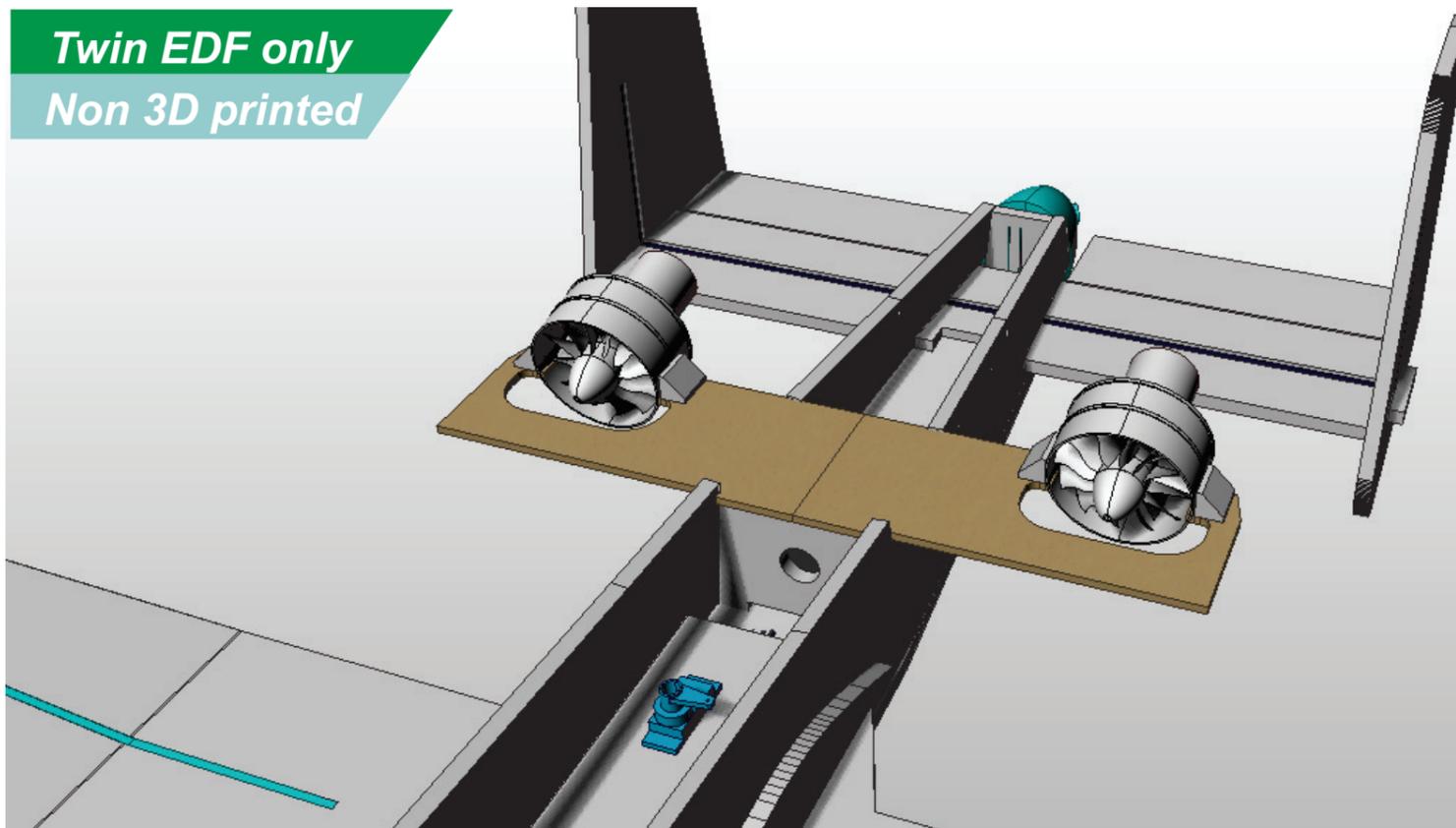
Cut the EDF motor spar out of 3mm lite ply.

Use the jig to position the EDF units at the correct vertical position and angle.

Hold the EDF units in place using hot-melt glue.

Twin EDF only

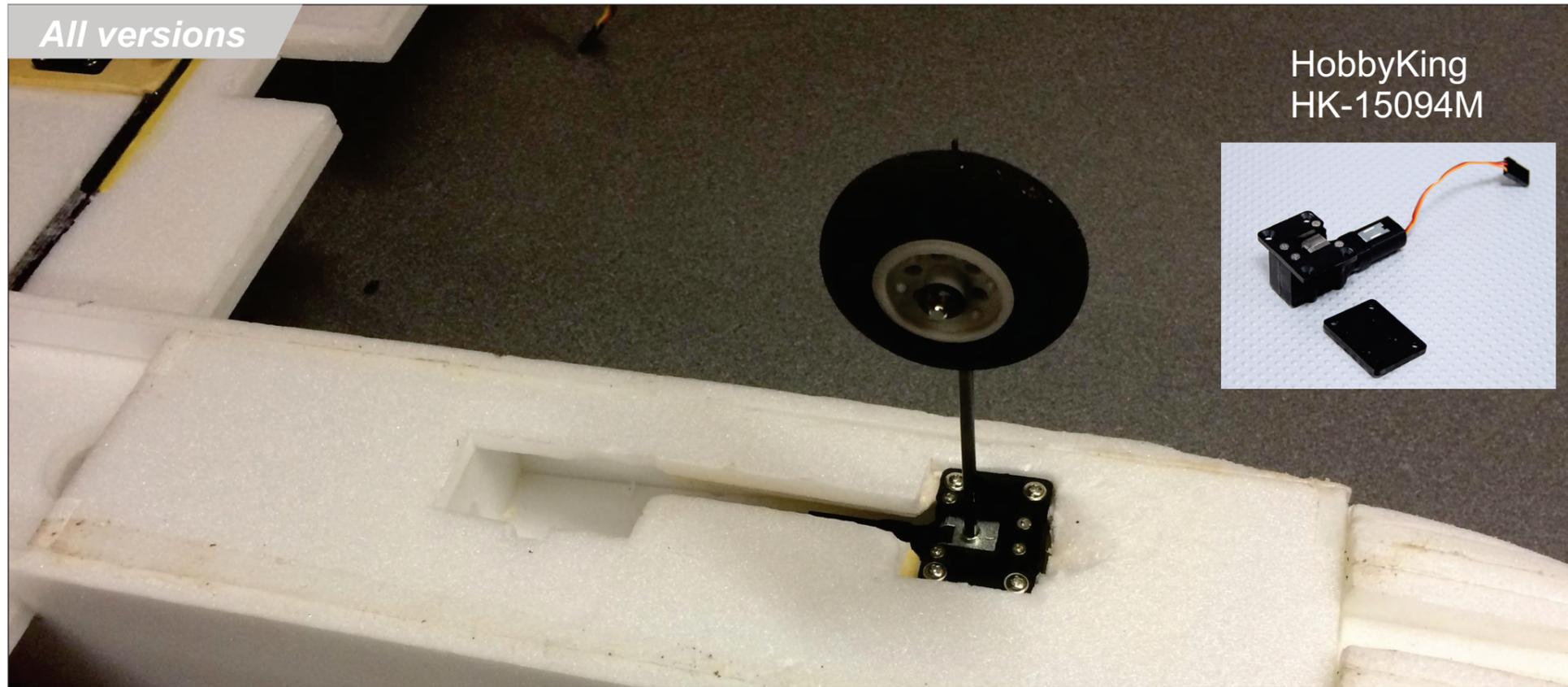
Non 3D printed



Use balsa blocks to reinforce the joint top and bottom, using epoxy to the ply, and hot melt to the EDF unit.



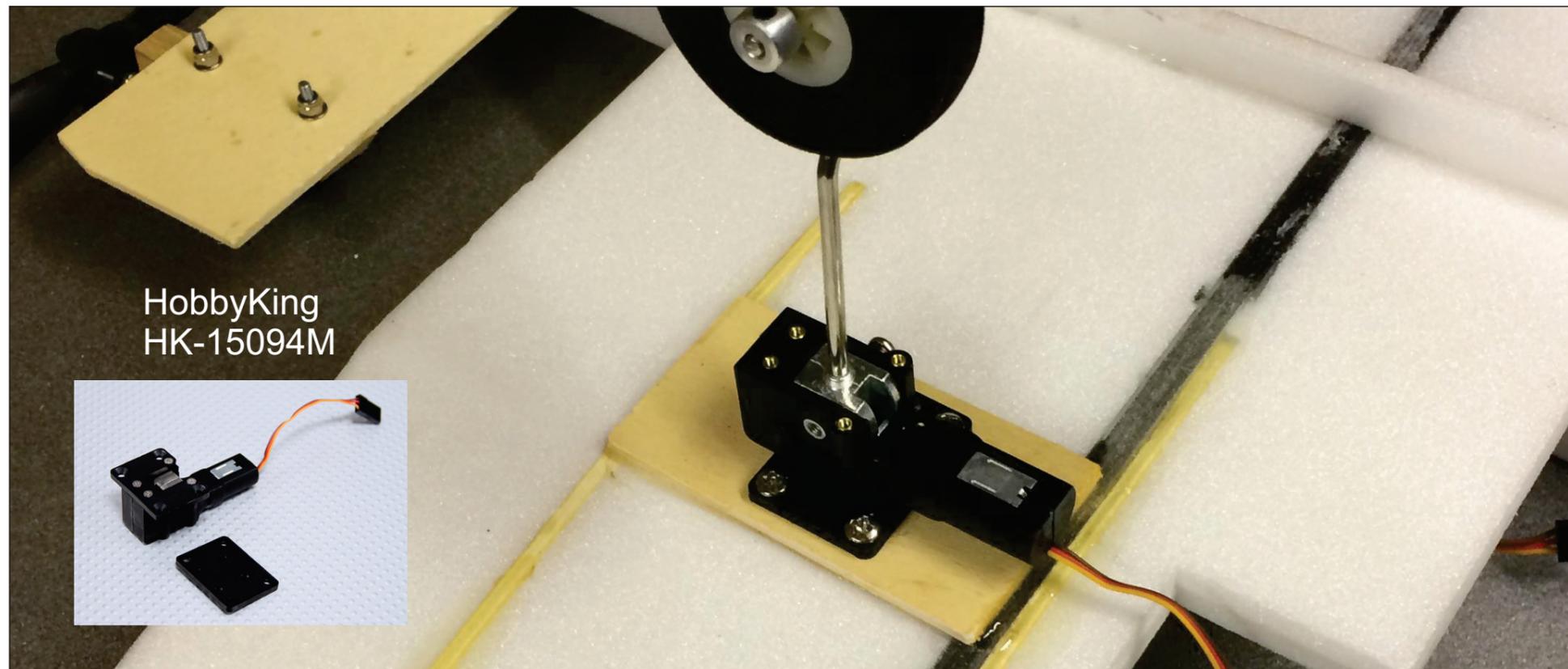
All versions



Mount the front undercarriage, screwing to the 3mm lightply in the fuselage.

I used a 3mm hardened steel rod.

A scale sized nosewheel would be between 40 and 45mm diameter

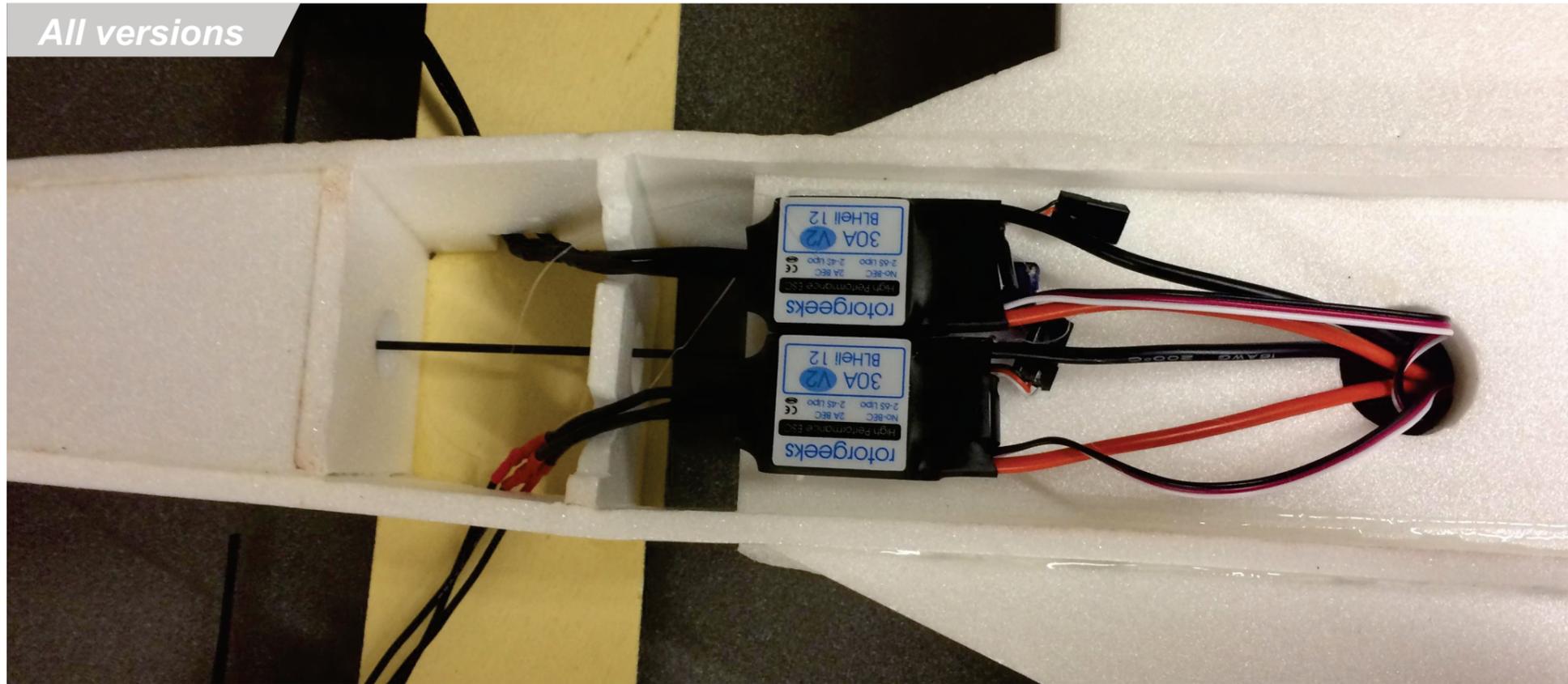


Mount the wing retract as shown here. Dry fit the wing wheel shroud to check for collisions.

A scale sized nosewheel would be between 55 and 65mm diameter



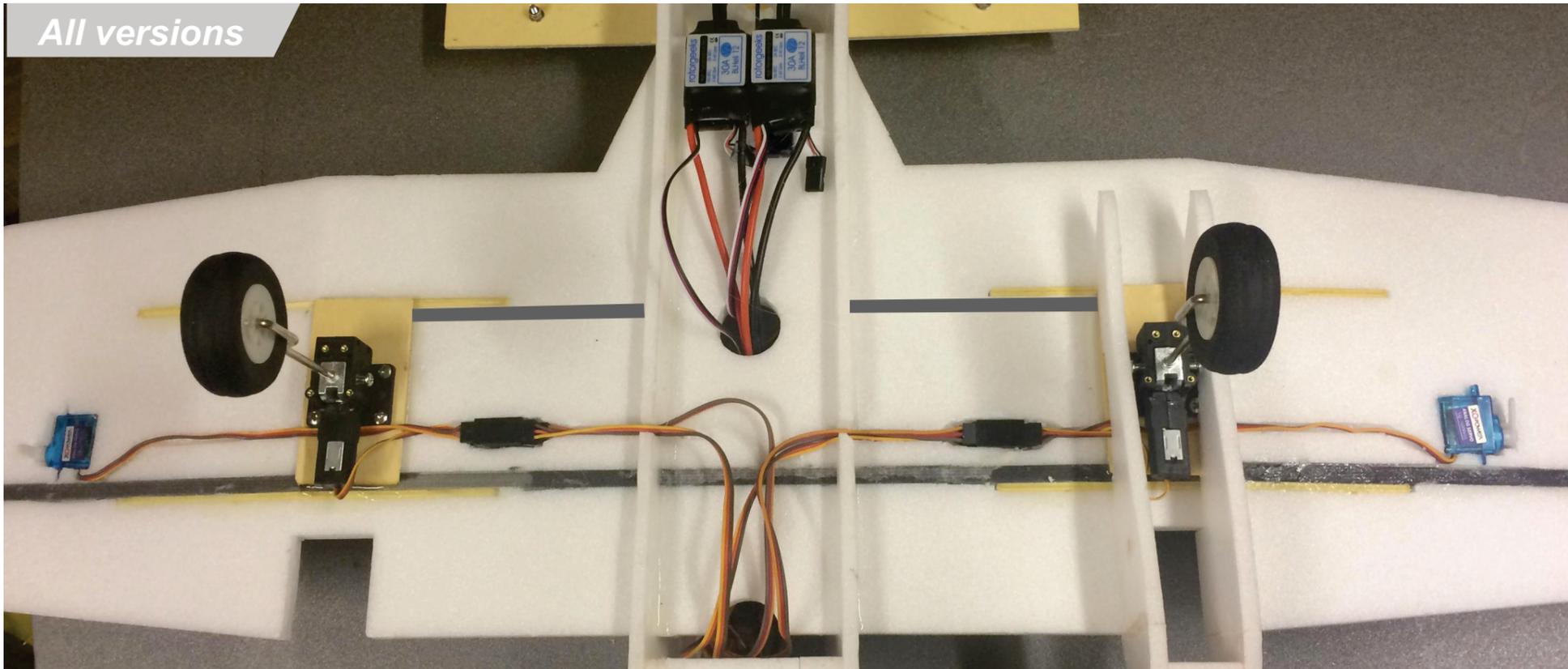
All versions



Run the Single or Twin ESC's so that they align with the aperture in the belly panel to allow cooling.

I recommend if you are using retracts to run them on a separate BEC to avoid dip in voltage to the RX.

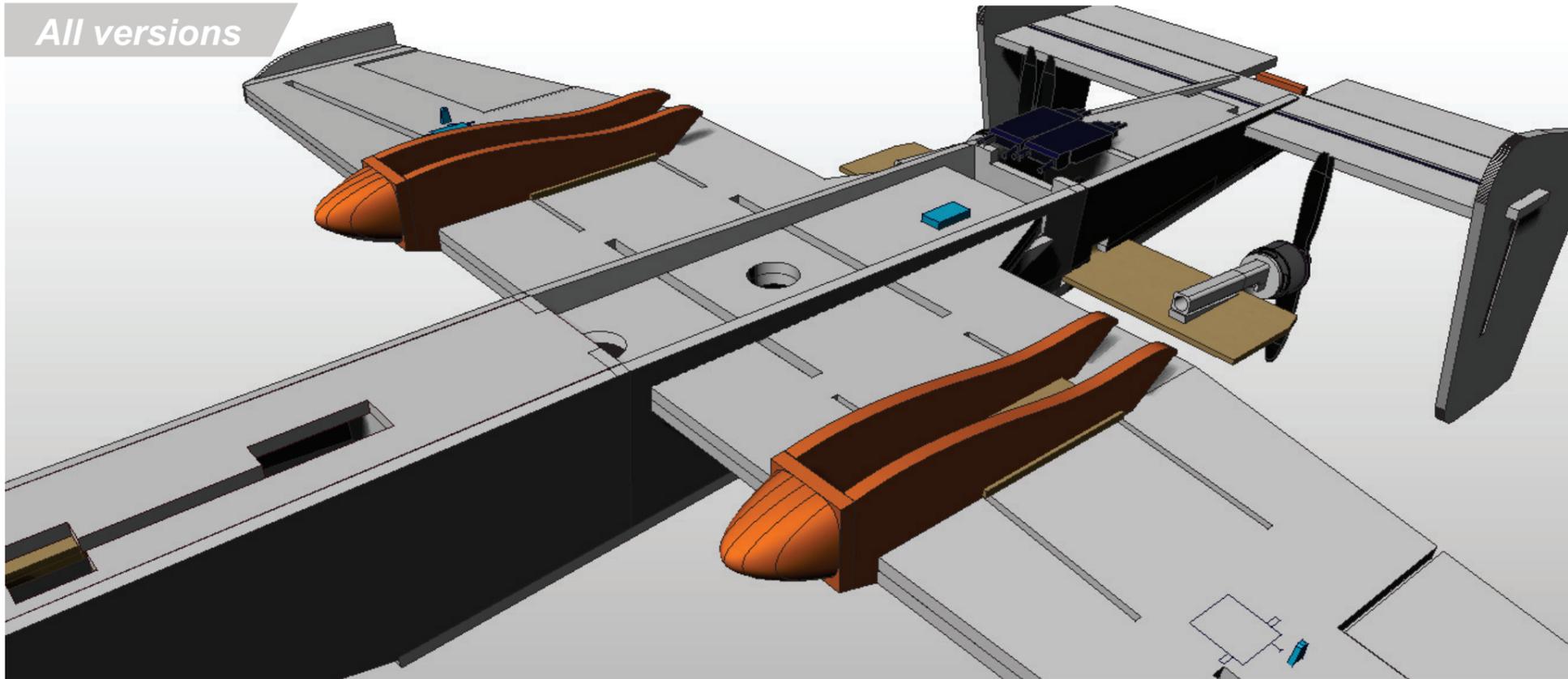
All versions



Connect the retracts and servos as as shown. Rebate the servo leads into the wing.



All versions



Glue the wing wheel shrouds to the wing, and adjust the retracts / wheels to fit.

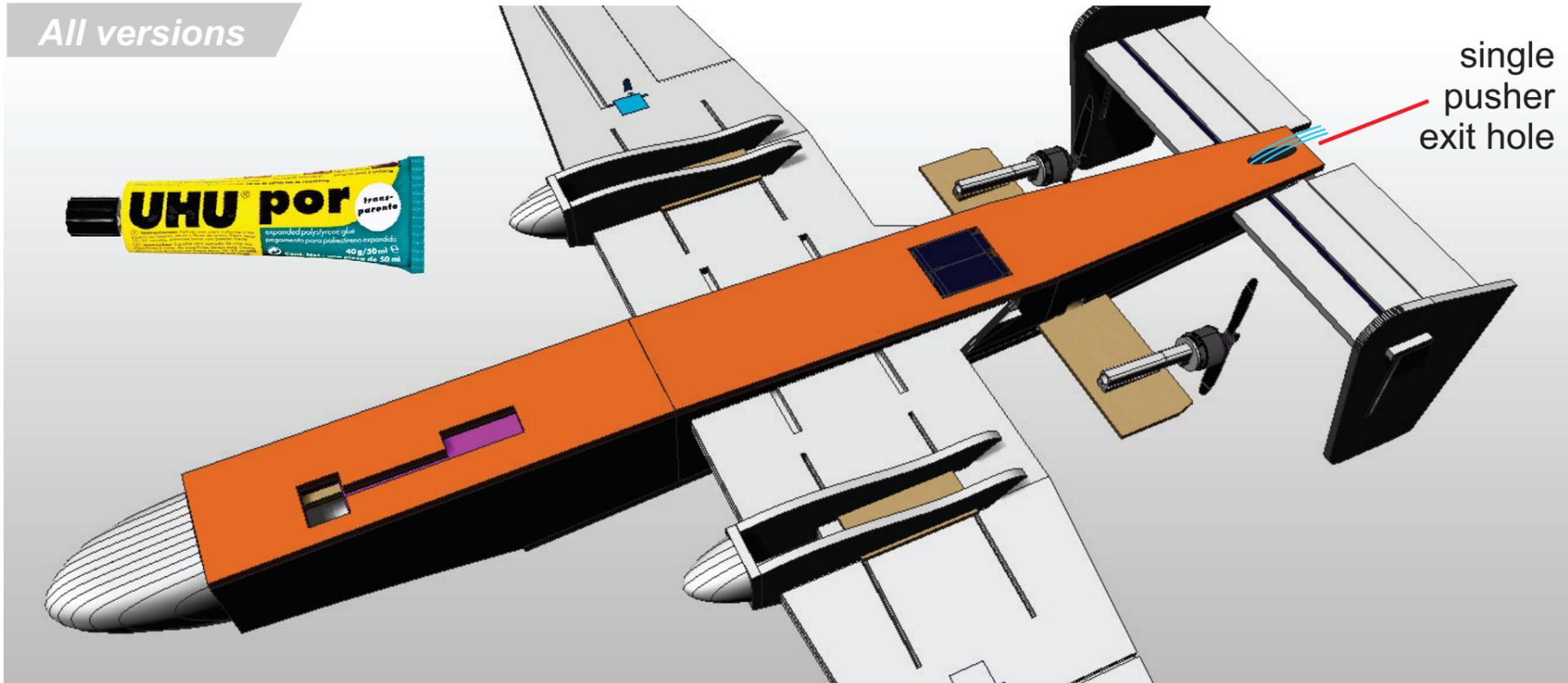
All versions



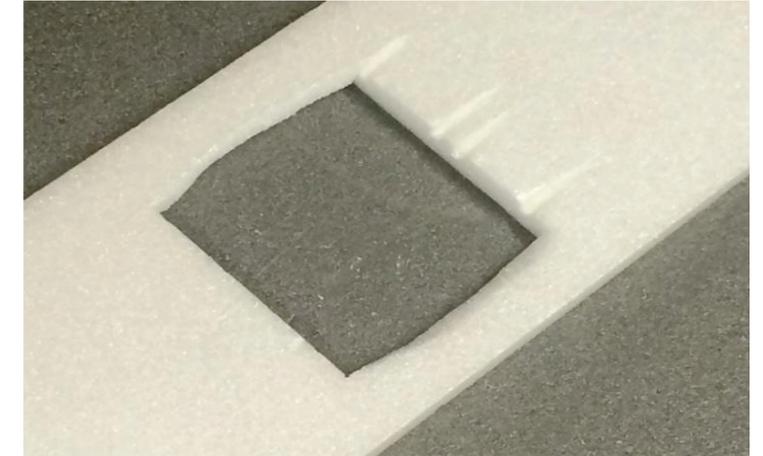
View from above



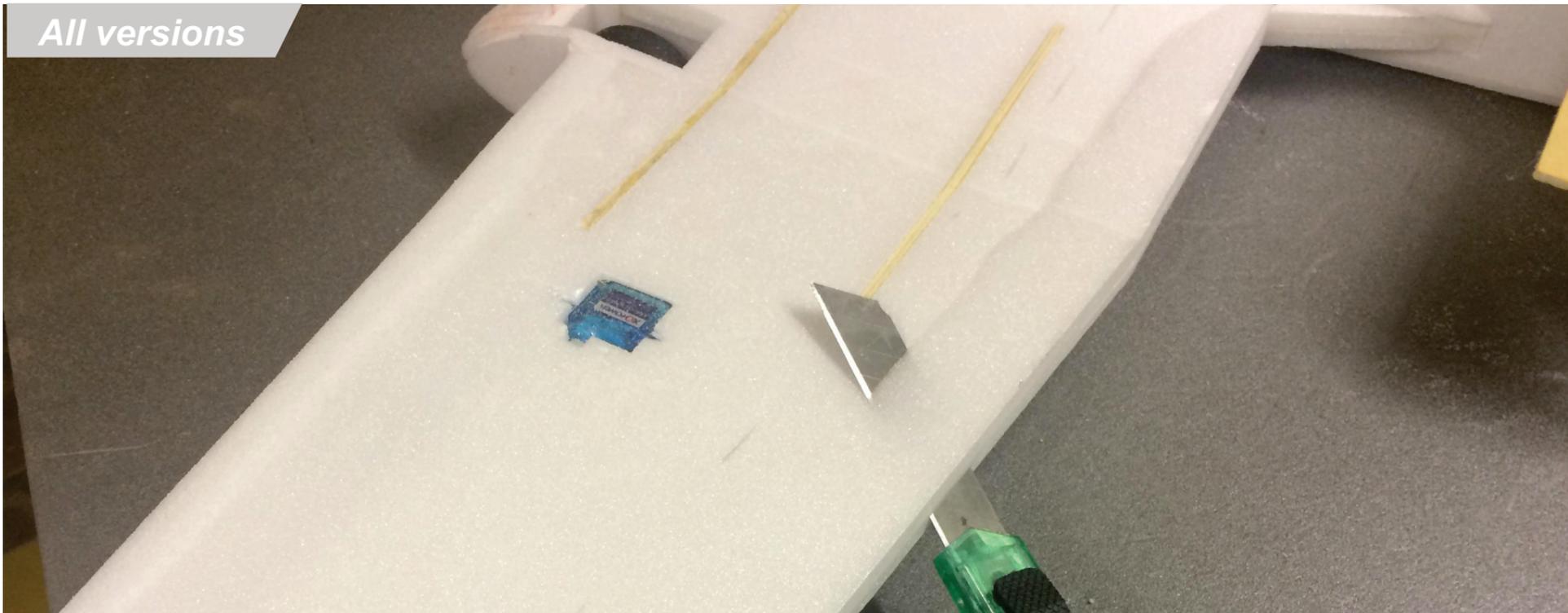
All versions



Trim away the depron to accommodate the cables to the ESC. For the single pusher version cut a hole at the end of the fuselage belly panel and run the ESC cables through. Stick on the belly panel



All versions



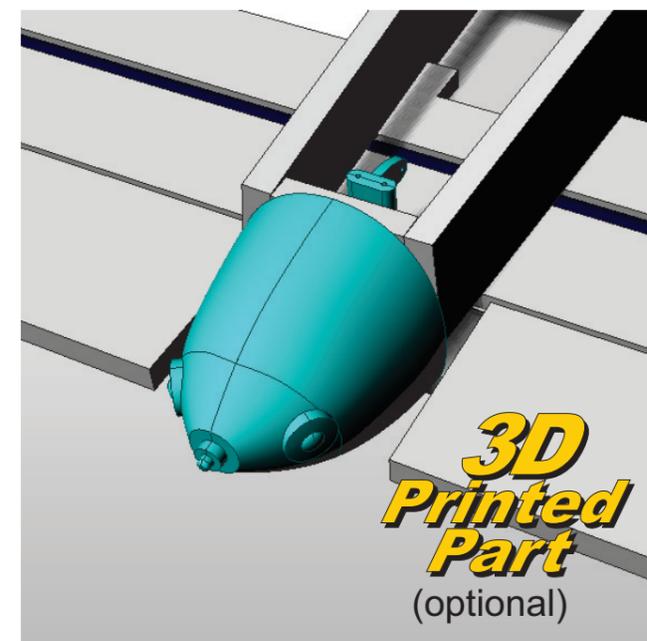
Use a long craft knife initially to trim away the bulk, then sand to an aerofoil shape - see below.



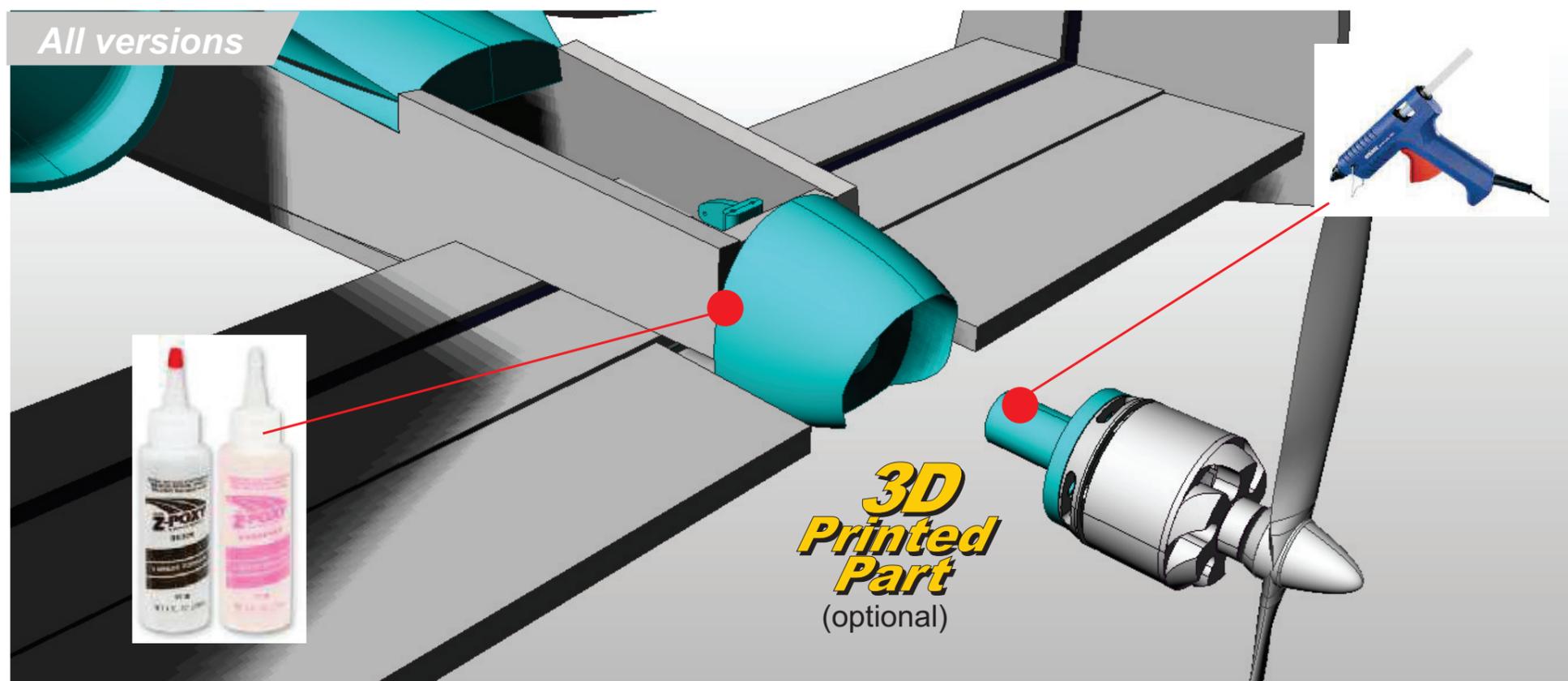
All versions



Glue the tail cone on to the fuselage.



All versions

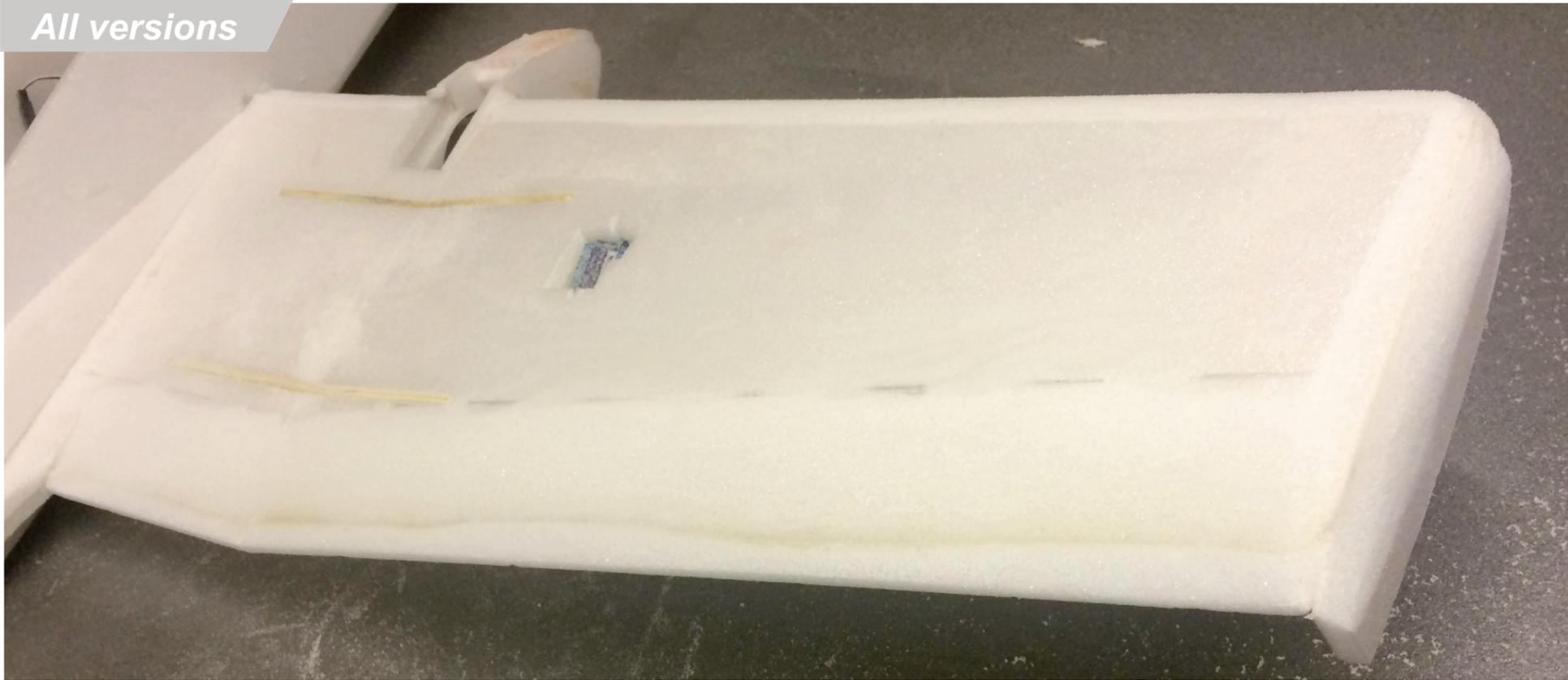


For the single pusher version, glue the base onto the fuselage with epoxy.

Once you have bolted the motor mount to the motor, slide the motor assembly into the base. Use a few drops of hot melt glue to hold it in place, but not too much to prevent it from easily being removed if needed.



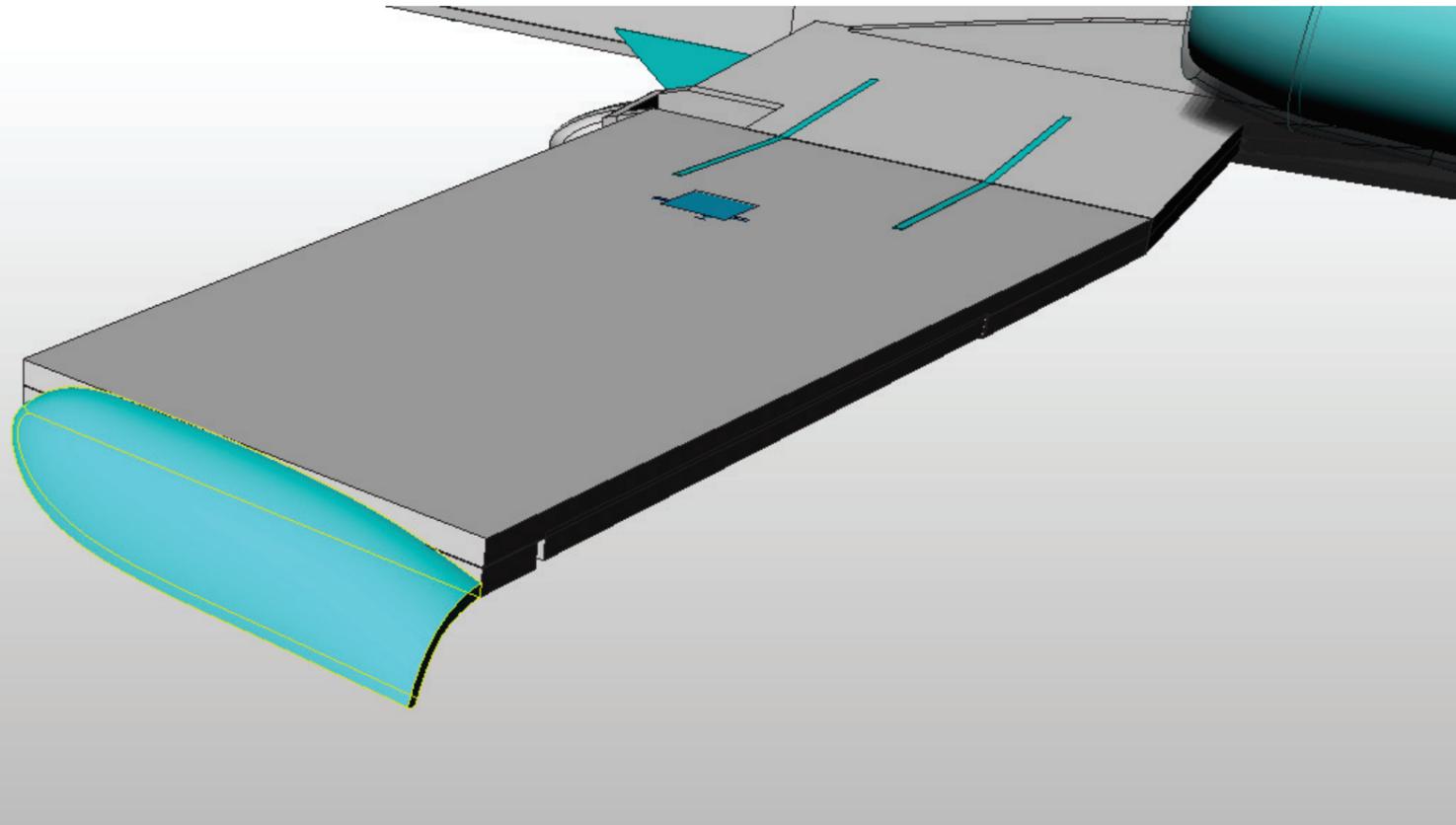
All versions



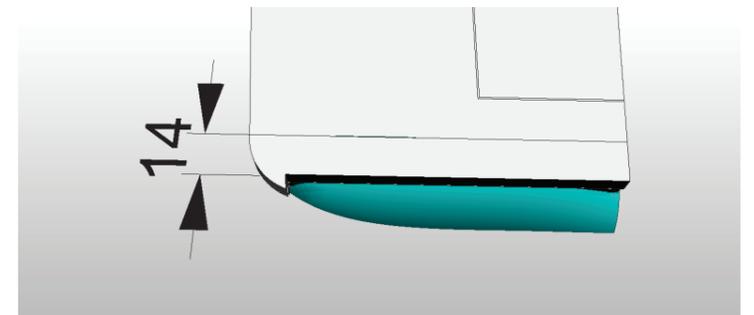
Sand the top edges of the wingtips to give that 'A-10 shape.

All versions

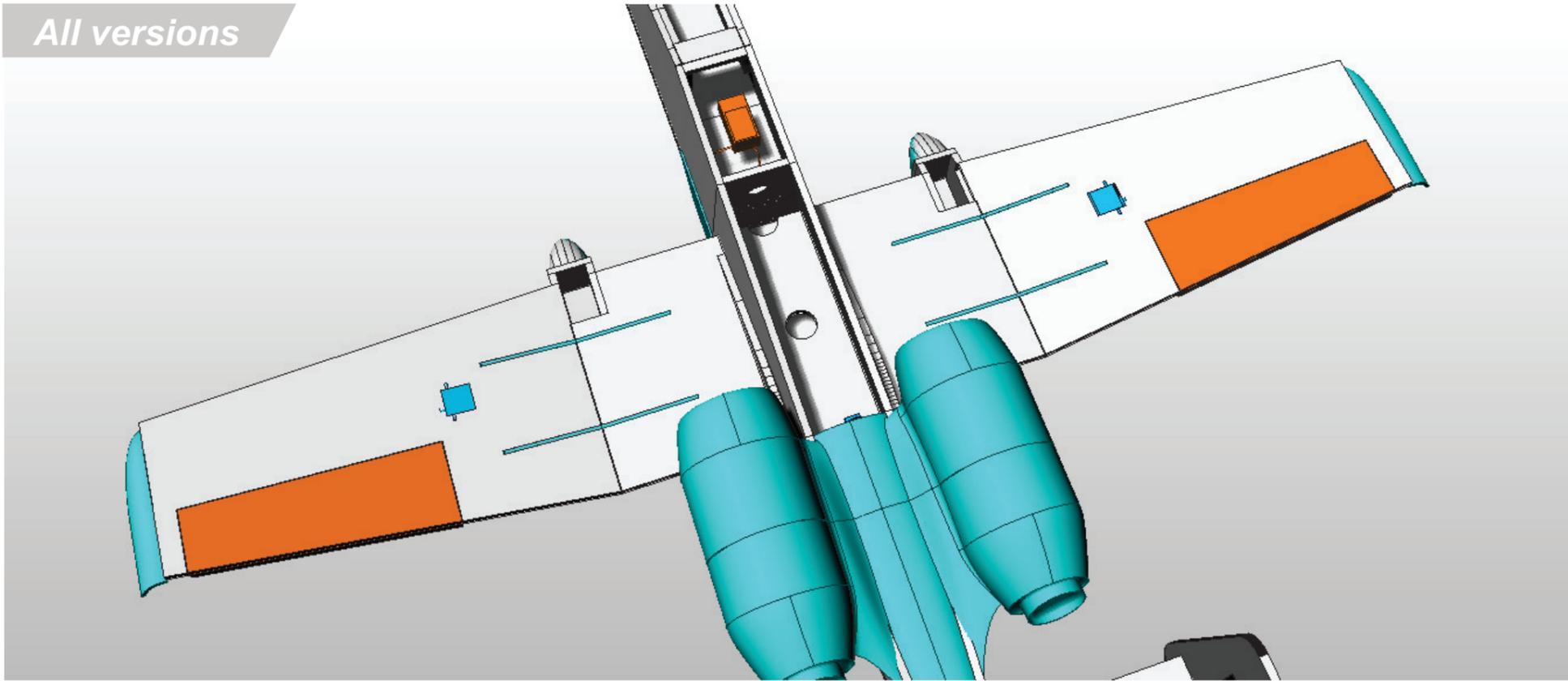
**3D
Printed
Part**
(optional)



Alternatively trim the wingtip by 14mm and glue the 3d printed winglets on.



All versions



Trim away the ailerons from the wing.

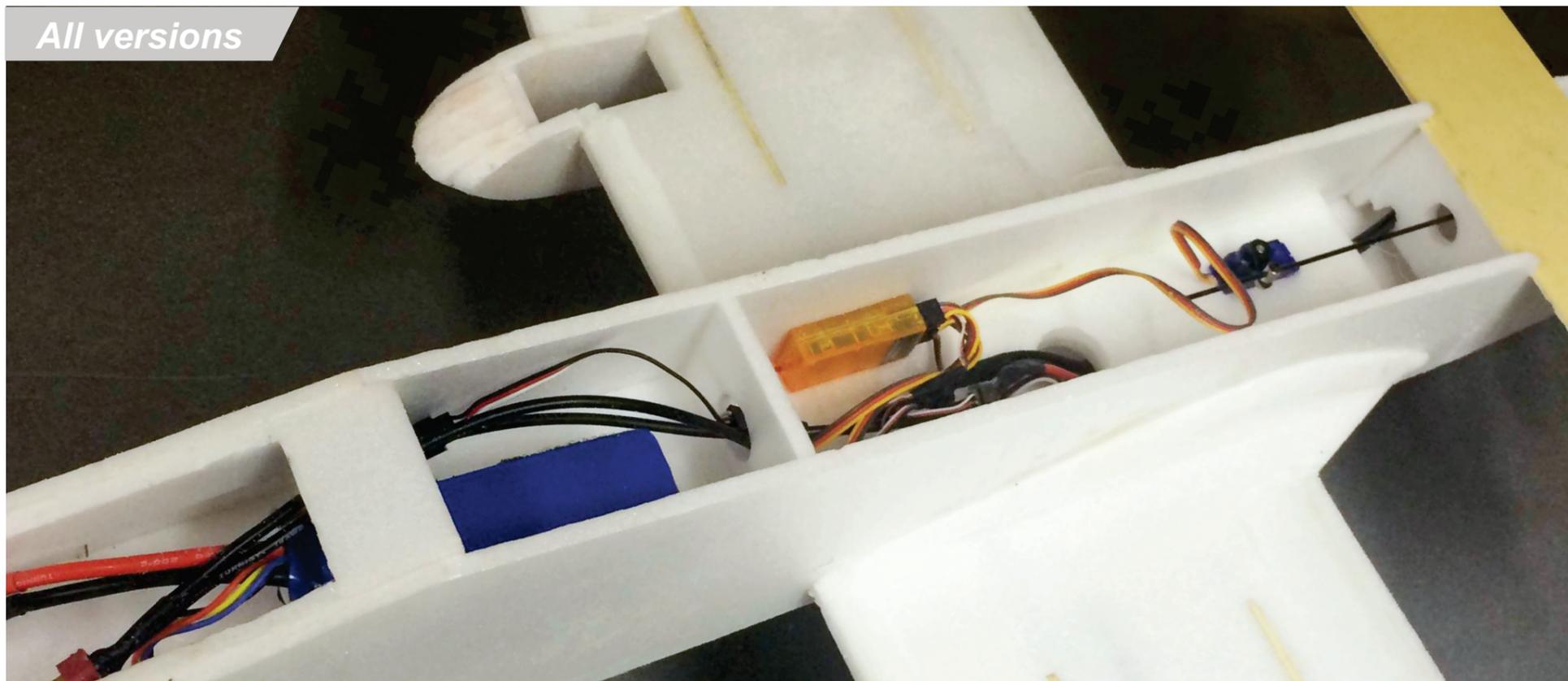
All versions



Shape the ailerons into an aerofoil shape like shown.



All versions



Glue the receiver in place in the fuselage above the wing.

I like to extend a 'bind' wire into the cockpit area in case I need to re-bind the RX. That way I won't need to cut open the fuselage - I simply use a servo extension lead.

All versions

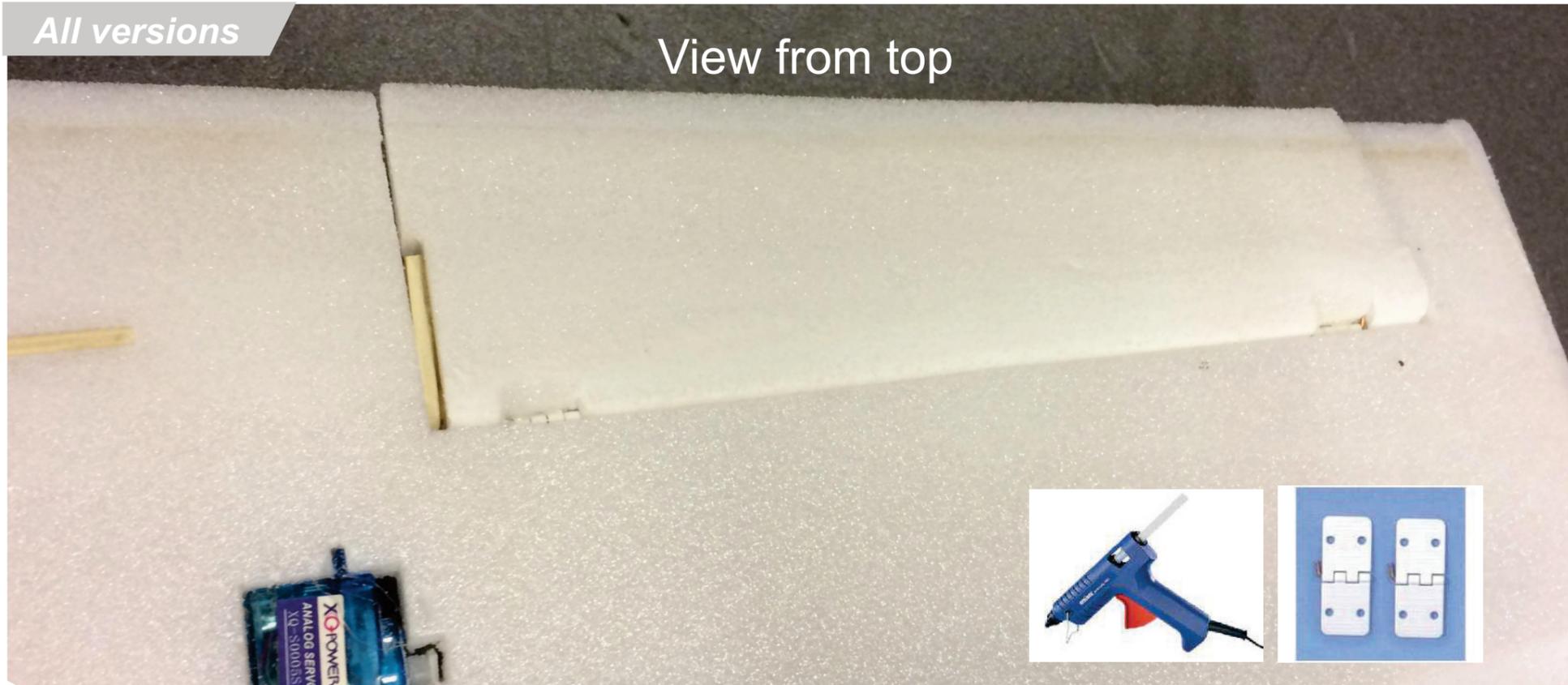


Use 3mm depron, glue the top pieces of the wing wheel shroud in place.



All versions

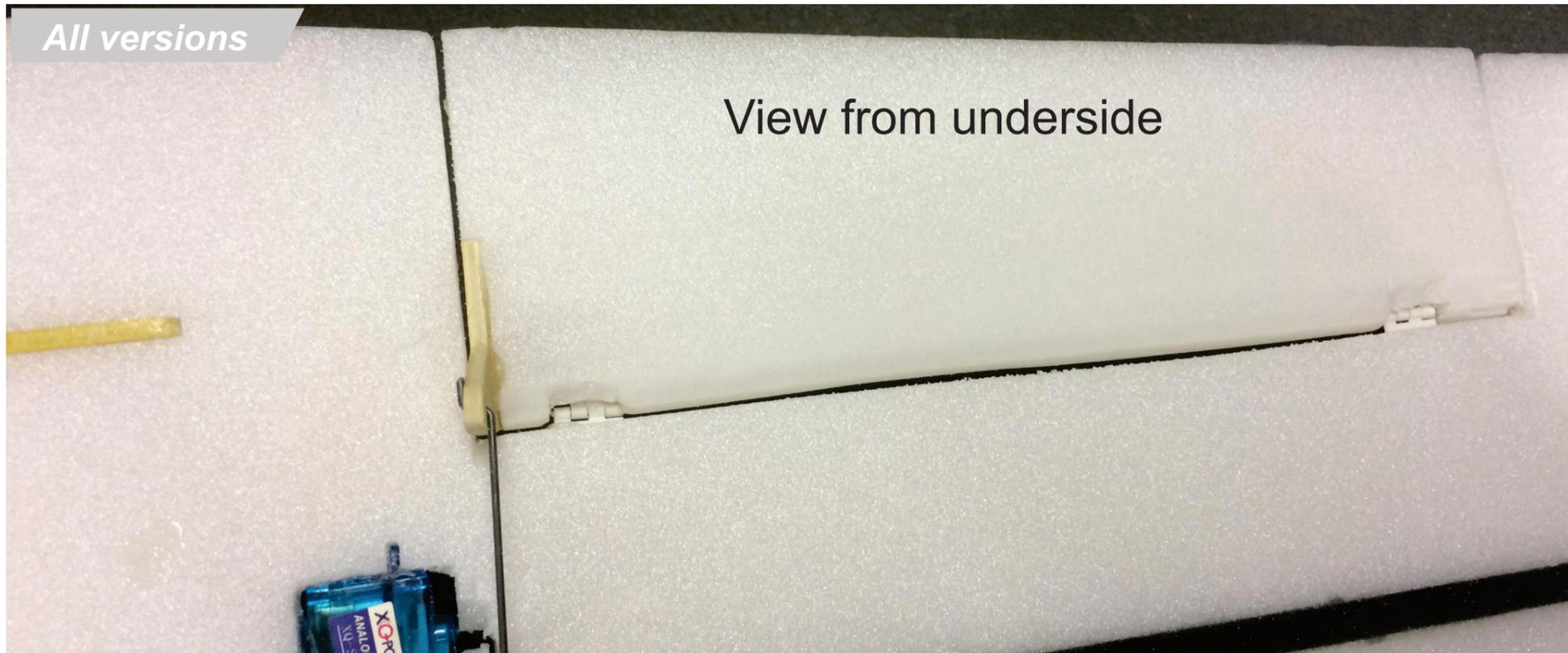
View from top



Glue the ailerons back onto the wing.

All versions

View from underside

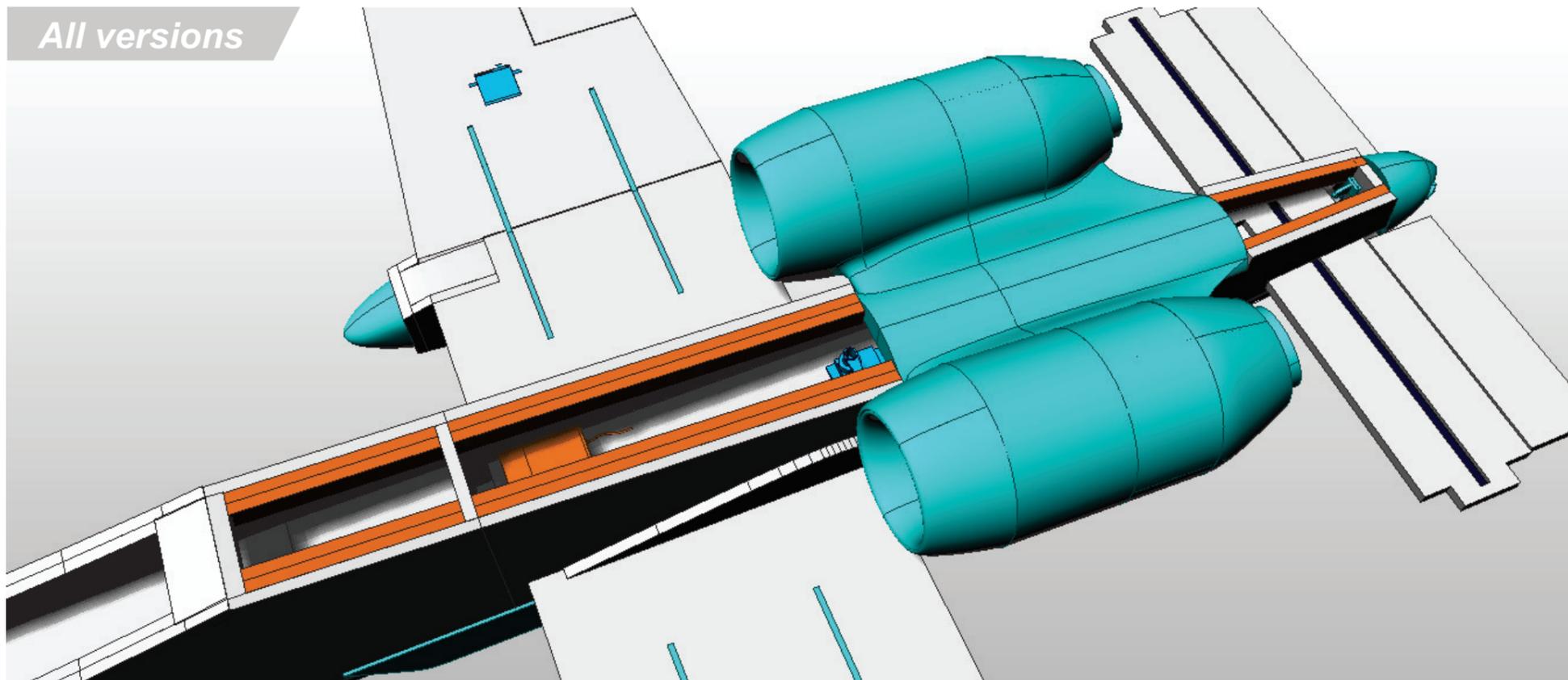


Make a servo horn and connect the servo to it using piano wire.

The throw of the aileron needs to be +/- 30 degrees.



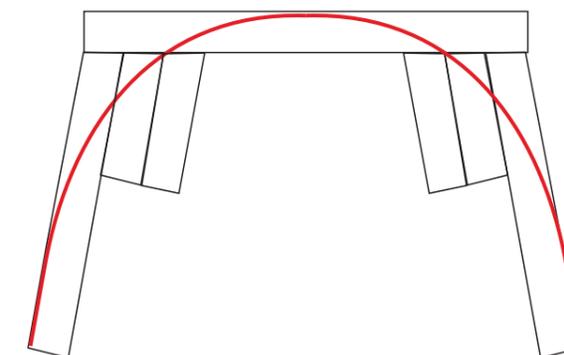
All versions



Stick 2 lengths of 20mm wide 6mm depron along the top edges of the fuselage as shown.

A single length can be used behind the nacelles.

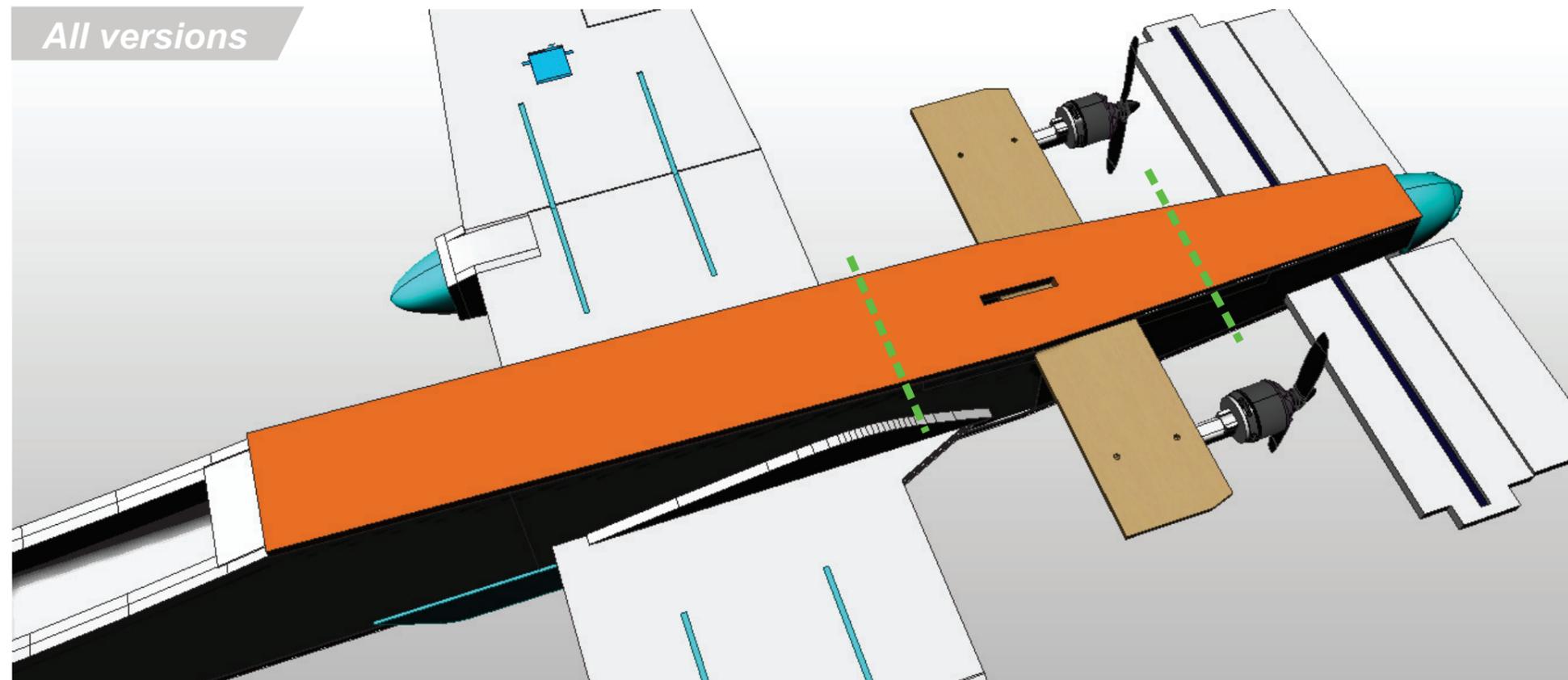
Later the fuselage will need to be sanded like this :-



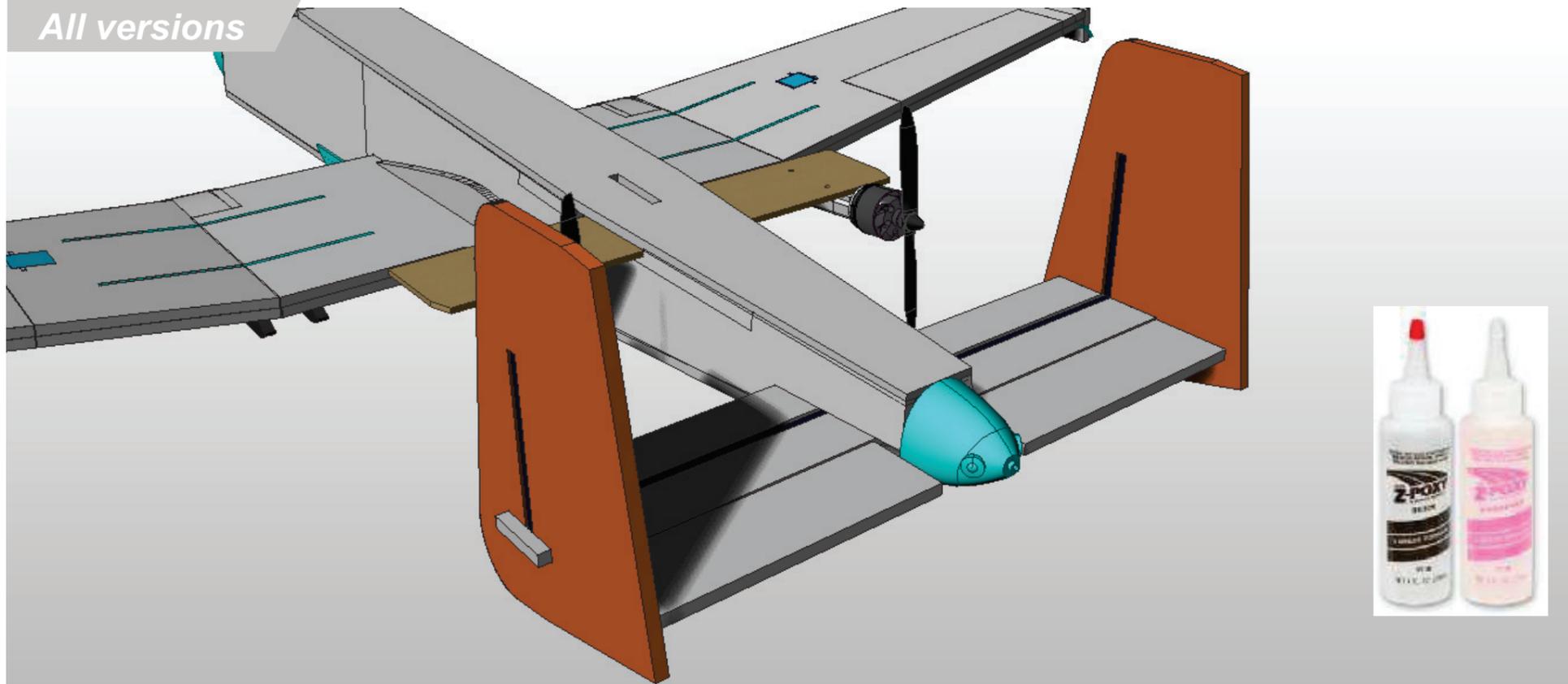
Run a sanding block over the fuselage to ensure a flat surface, then glue the **Fuselage Top** to the assembly.

If you are using 3D printed nacelles, then simply cut away the area that has been replaced by the 3d printed part.

All versions



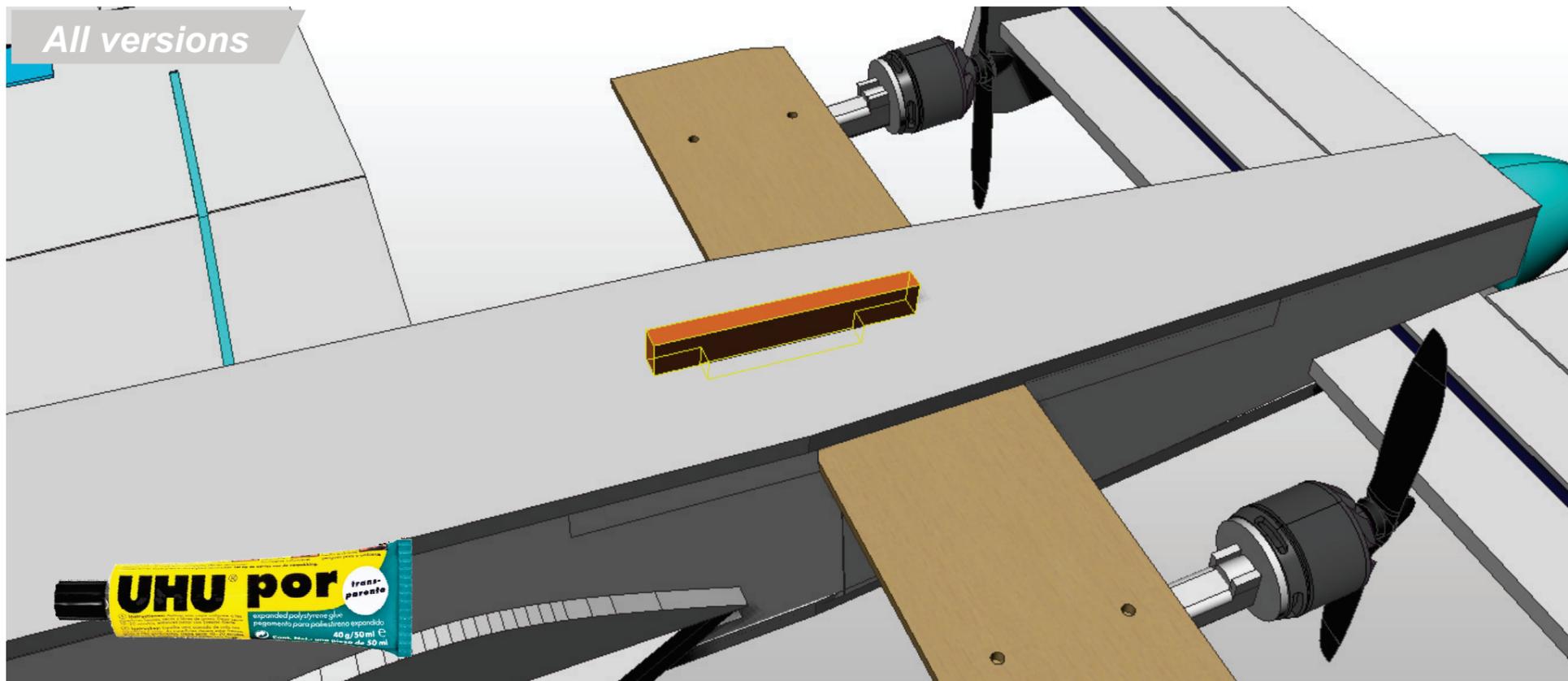
All versions



Glue the **vertical stabiliser** in place using epoxy.

Ensure that they are glued 90 degrees to the horizontal stabiliser.

All versions

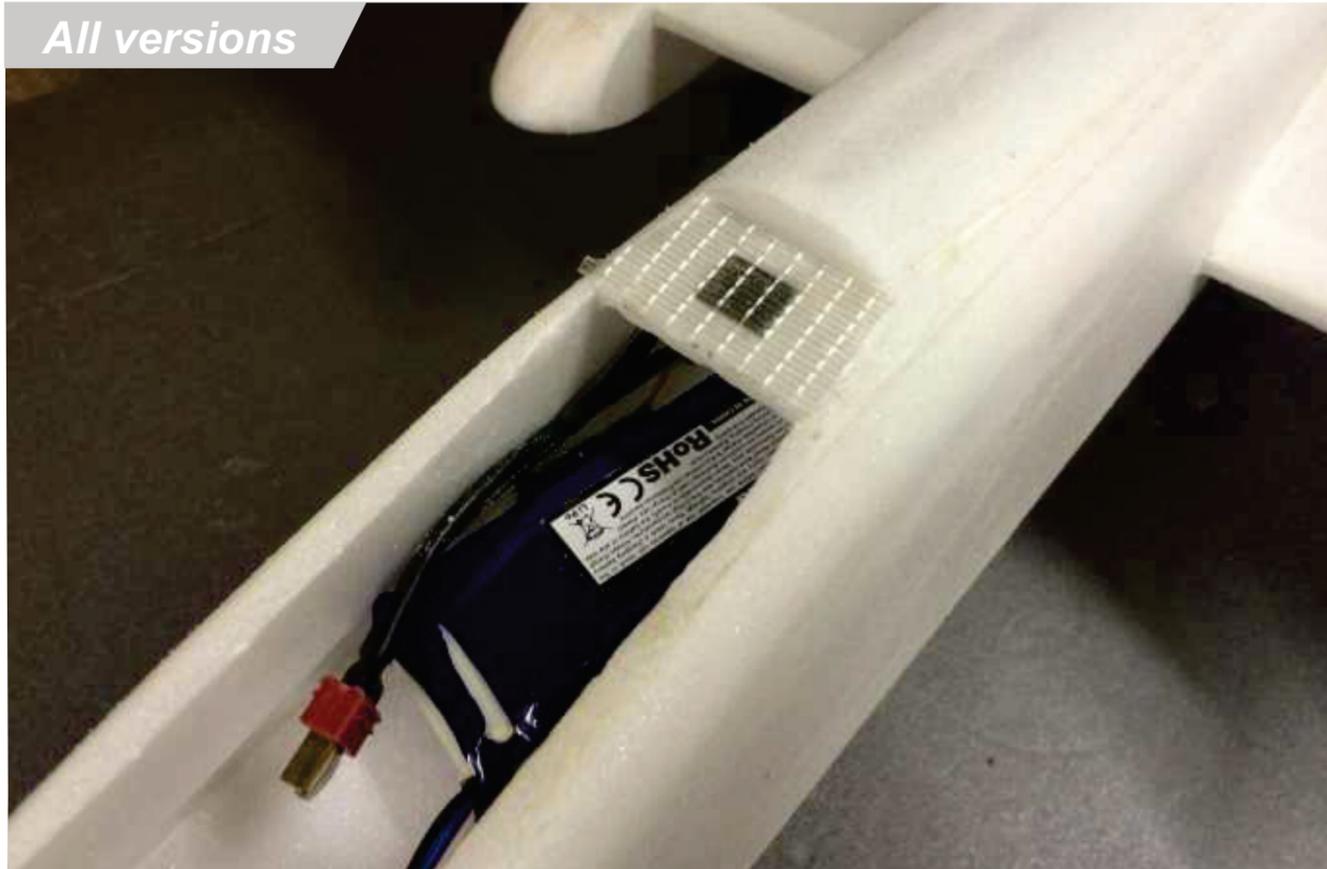


Glue the **Top fuselage ridge piece** in place as shown.

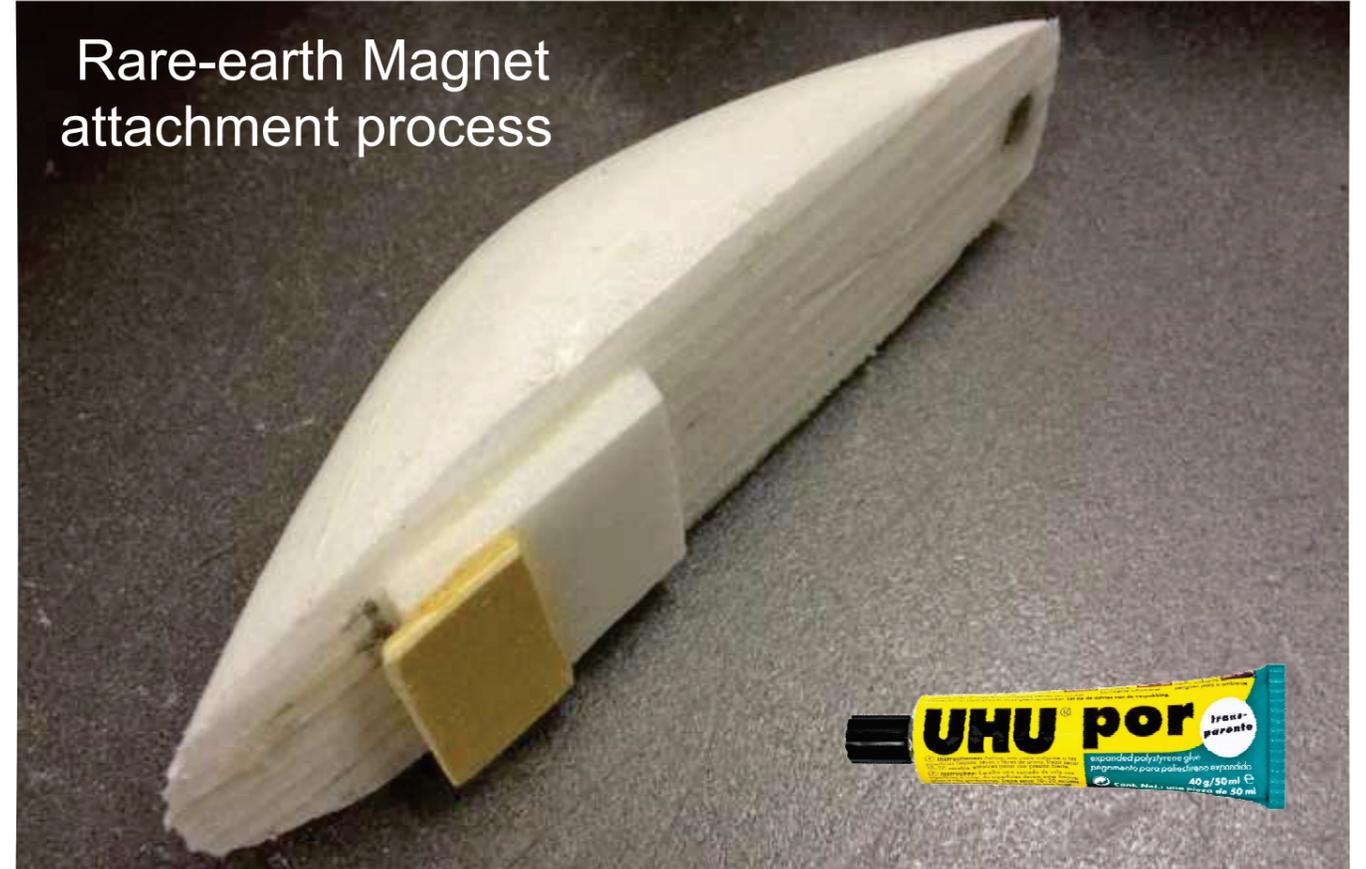
For the 3d printed nacelles, simply trim off the tab and glue over the centreline.



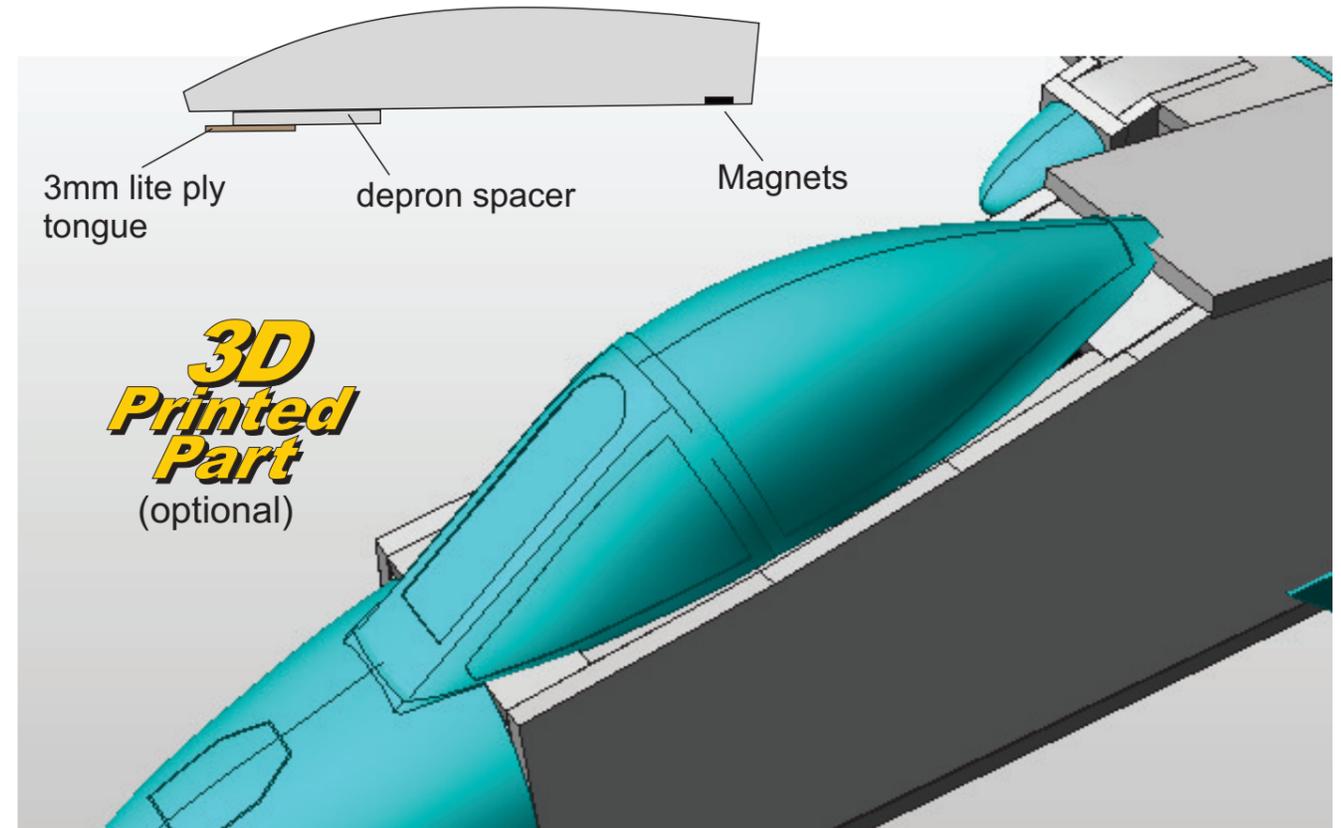
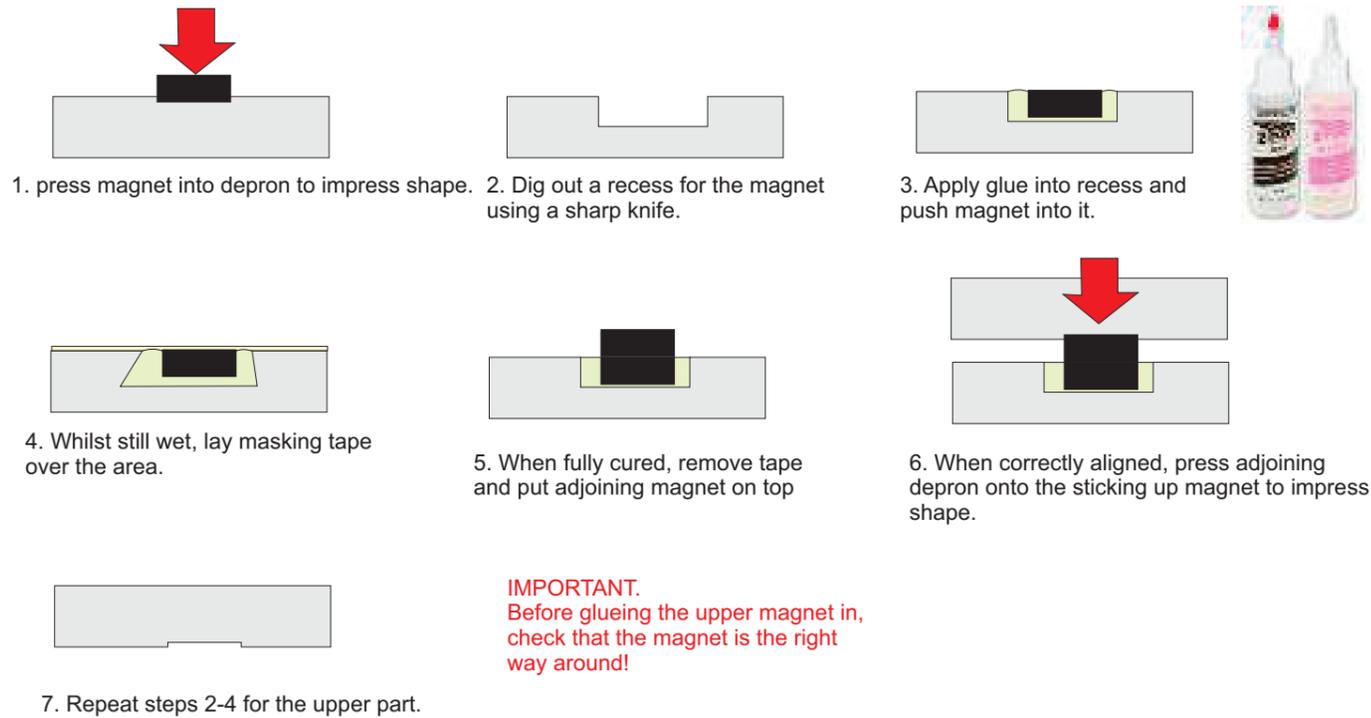
All versions



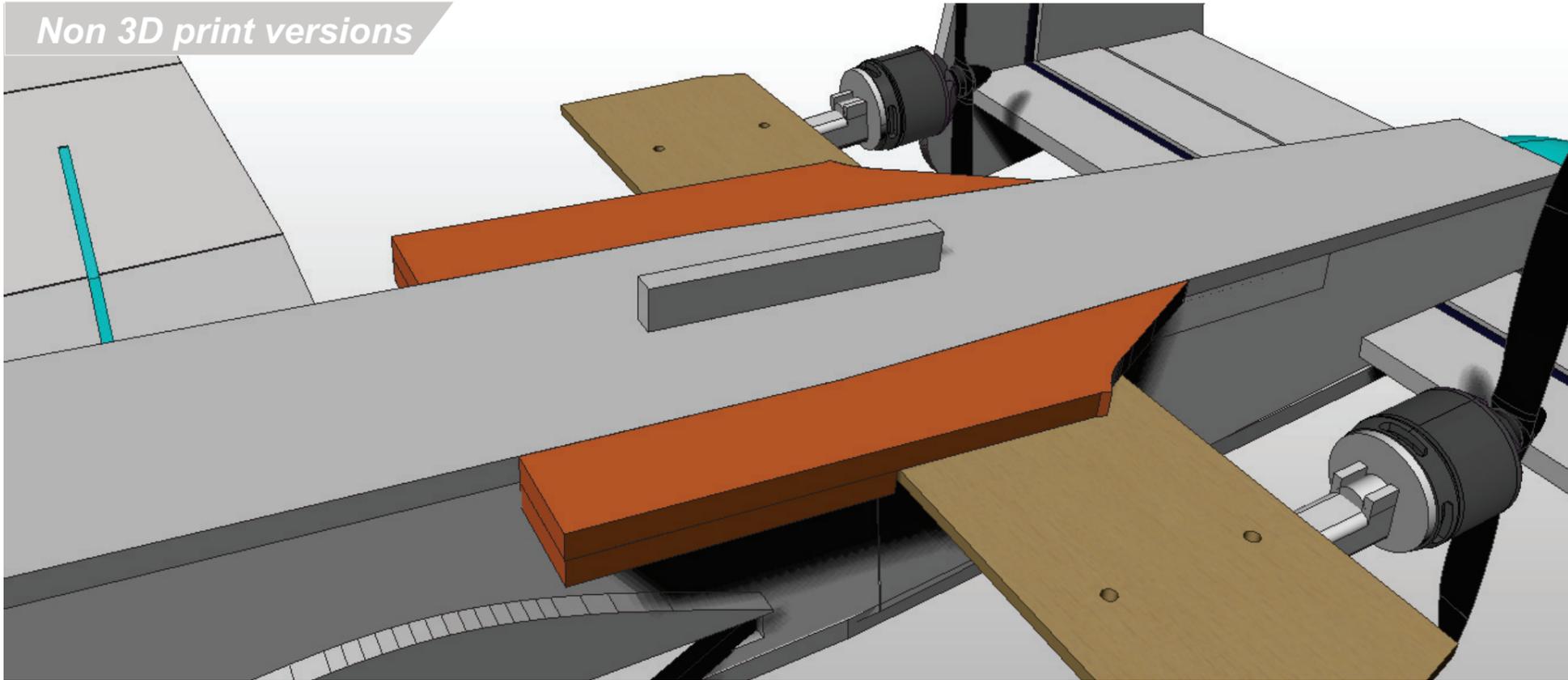
Rare-earth Magnet attachment process



Create the canopy in the same way as the nosecone, or 3d Print one, and add a tongue and magnets as shown.



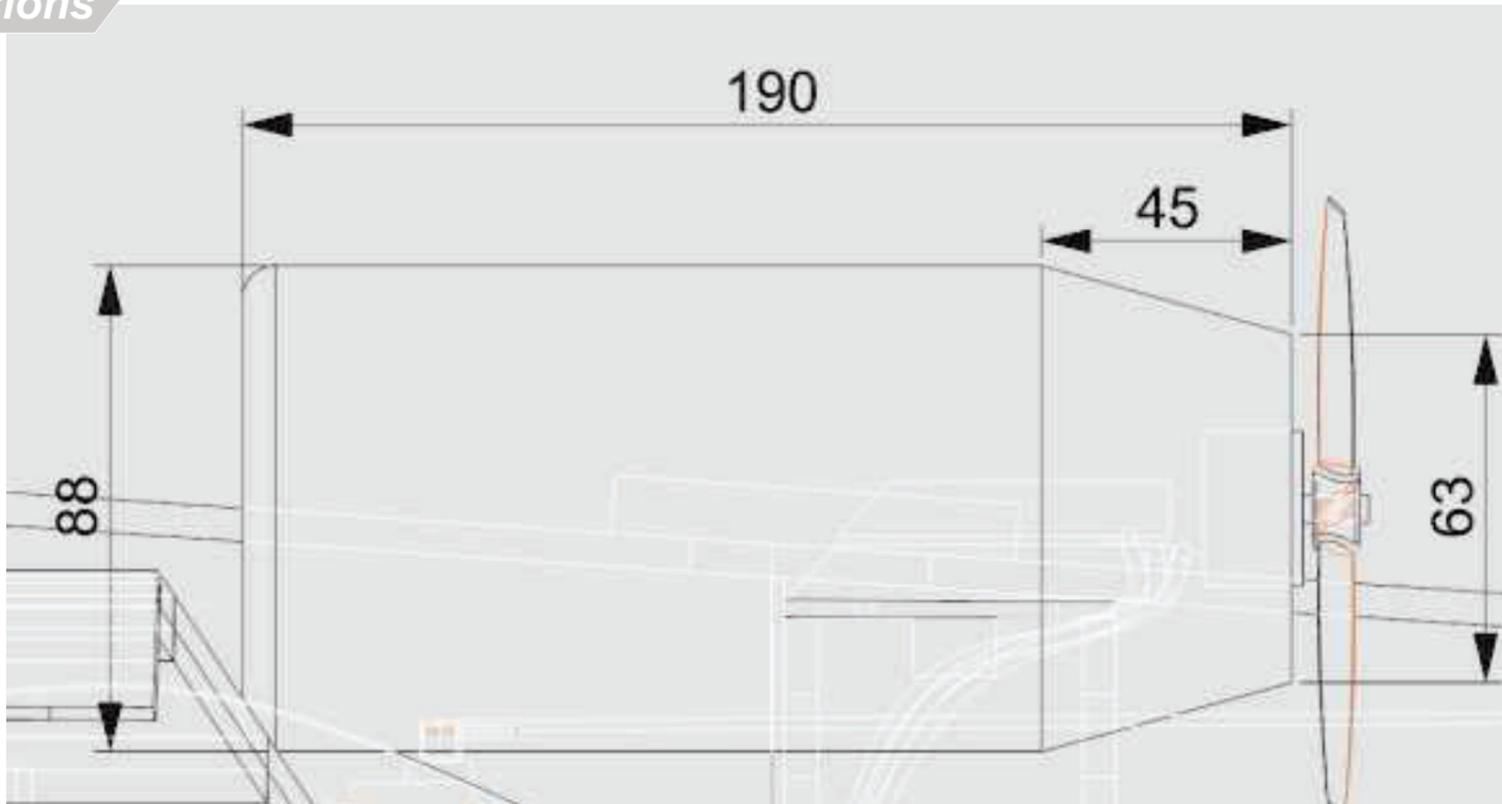
Non 3D print versions



Glue the **Nacelle bridge** and **Nacelle bridge supports** together. Shape the forward edge and glue to the assembly as shown.



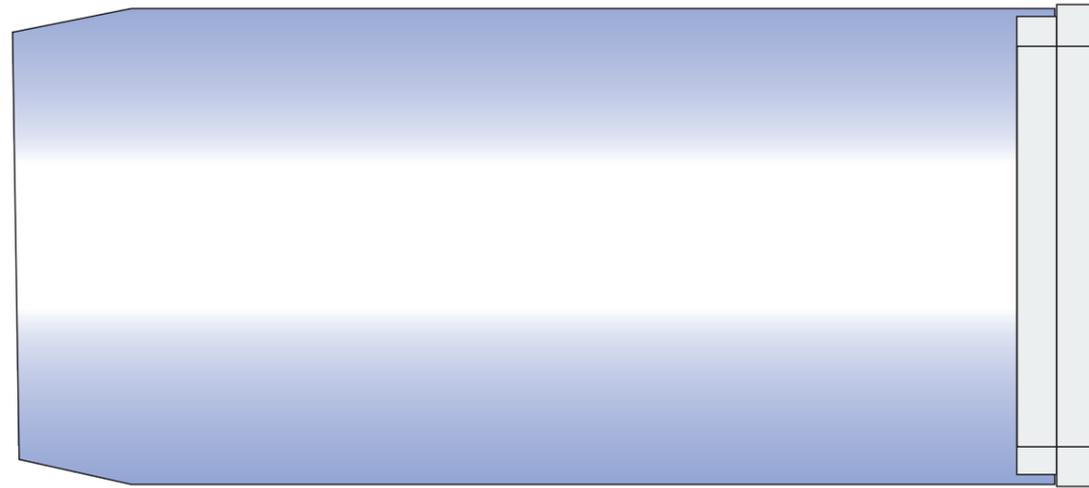
Non 3D print versions



Either create your own nacelles using 3mm depron, or use a 1litre fizzy water bottle trimmed to size to create the Nacelle shape.



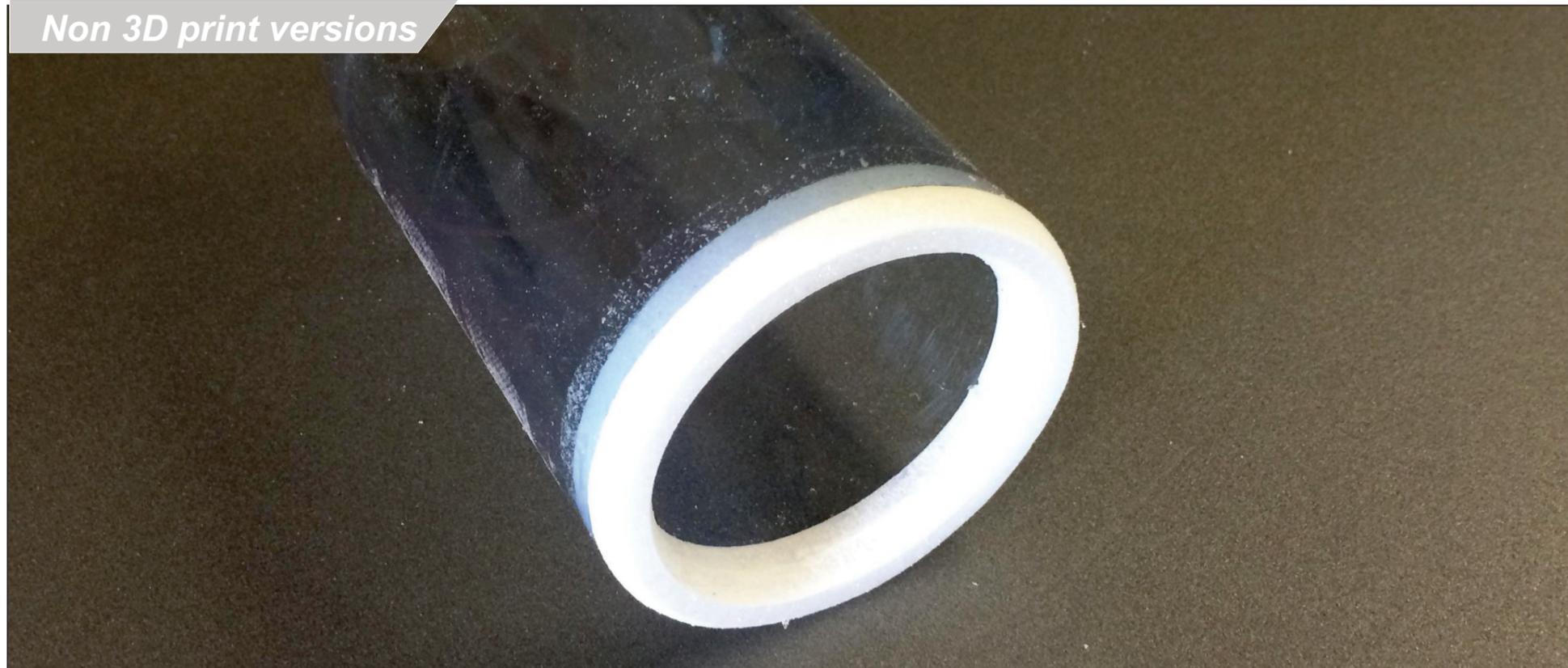
Non 3D print versions



If you have chosen to use a plastic bottle to create your nacelle, you will need to create a soft leading edge.

To do this create two depron rings in - one to sit inside, and one to sit in front of the bottle.

Non 3D print versions



Glue the rings to the bottle, and then sand to shape to give the look of the A-10.



All versions with Retracts

**3D
Printed
Part**
(optional)



Assembly the avionics pod and glue to the fuselage as shown

All versions with Retracts

**3D
Printed
Part**
(optional)



Glue the lower fins in place as shown.

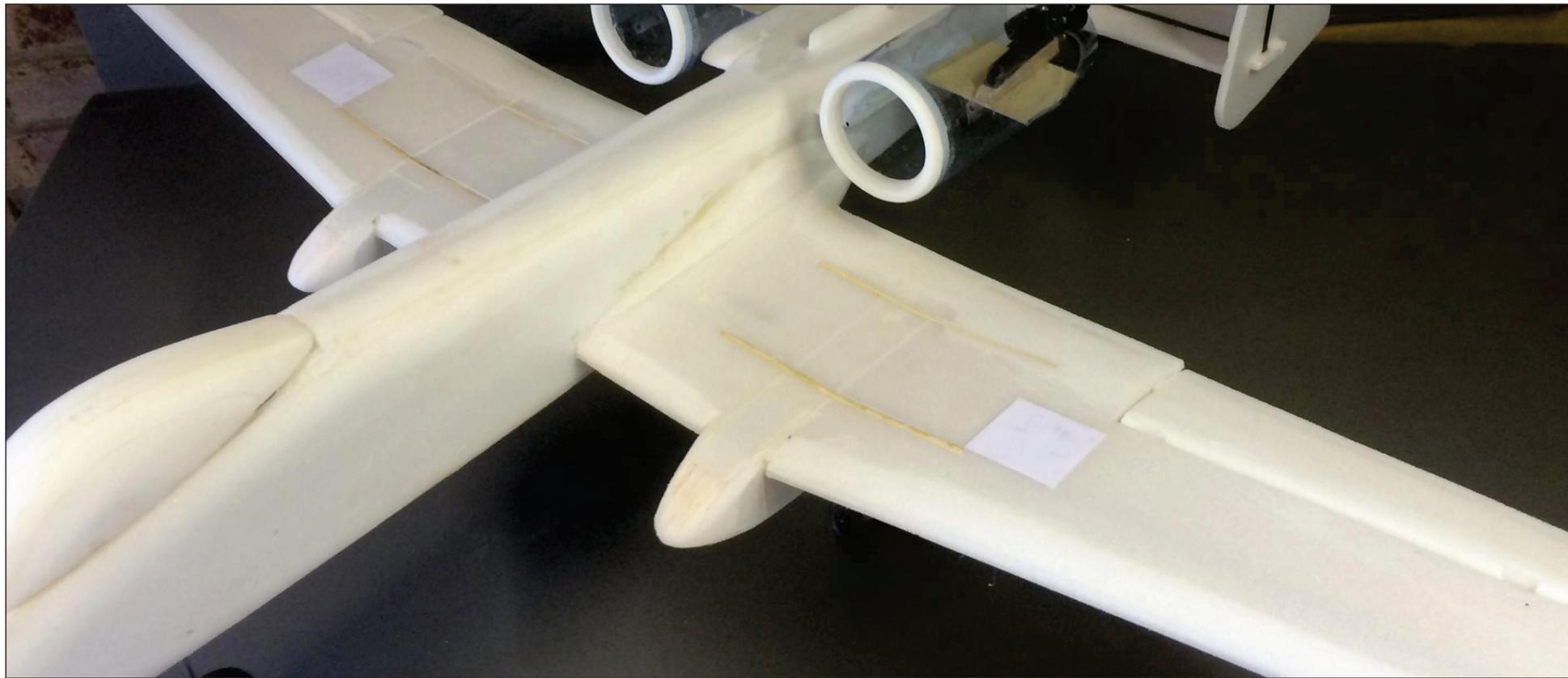




Carefully cut the nacelles to slide over the plywood spar and butt up to the nacelle supports.

The pieces will need some finer shaping to ensure a good fit.

Once butted use UHU por to hold in place. Hot melt glue will distort the plastic bottle.



Cover the servos and servo lead channels with paper - stuck down with UHU por.

Congratulations! You have completed You're A-10 Warthog

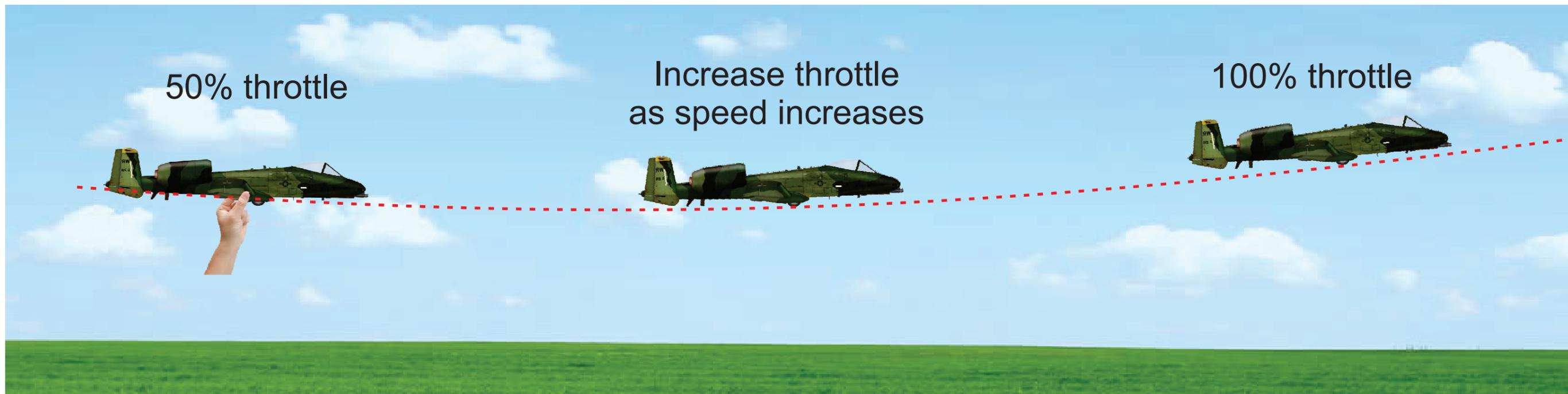


Use photo's to help shape
Your model to represent
the real plane



A-10 Thunderbolt II





IMPORTANT : Due to the high engine positions on the original plane. The thrust angle is inclined to intersect the Centre of Lift - see diagram below.

If you hand launch with full thrust, the plane may not lift into the air, as the downwards thrust will overcome the lift generated at slow speeds of a hand launch. Therefore launch the plane at 50% throttle until it gains speed - then it will be fine. If you are taking of using bungee or retracts, there shouldn't be a problem

