

JETWORKS



DRAKE III
Parkjet

3D Printed part

THIS GUIDE IS FOR THOSE
WISHING TO CONSTRUCT
USING 3D PRINTED PARTS

Amphibious Stealth Fighter Jet

Construction Guide
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Drake History

The Drake III ASF is not based upon a real aircraft. It is designed to be a versatile and fun delta winged aircraft that can fly off Snow, Grass and Water. The designation ASF = Amphibious Stealth Fighter.

Having only flown Steve Shumate's Polaris, Seaplane design was something I'd not attempted before. Grateful thanks to Steve for producing this design.

Drake 1 : was the first attempt, I found that the aerodynamic sponson design wasn't very effective and caused the wings to dig in. The Propellor was also too low, so the aircraft never made it into the air. The water we tested it in was saltwater which corroded anything steel! The thrust angle was also incorrect tending to push the nose down.

Drake 2 : The attempt had a higher prop and new sponsons. It had a revised thrust angle and it flew from grass really well except it wasn't that directionally stable with the Thrust vectoring motor mount. Once airborne it has excellent High Alpha, Axial roll and is exciting to fly with no bad tendencies.

I tried it on water and found that the combination of flat rear hull and prop position caused the propellor to suck up the wake and stall the motor. The nose didn't want to lift as a result of insufficient power and the hull wasn't allowing enough of a launch angle to pull away from the water.

Drake 3: This design has been modified to raise the prop even higher from the wing and to put a barrier between the wake and the prop to prevent water being sucked into the prop. The hull design is closer to the traditional flying boat hull design, thinning as it goes aft, allowing for greater directional stability and pitch control. I have also added a rudder for greater precision and control than simply a thrust vectoring prop.

Designers Notes



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.

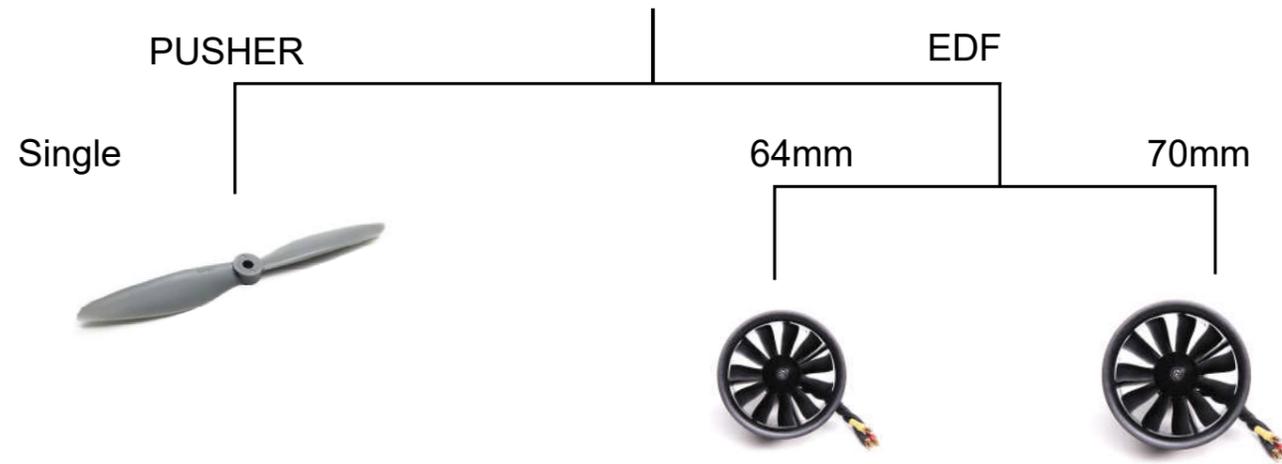
Glueing parts together.

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.

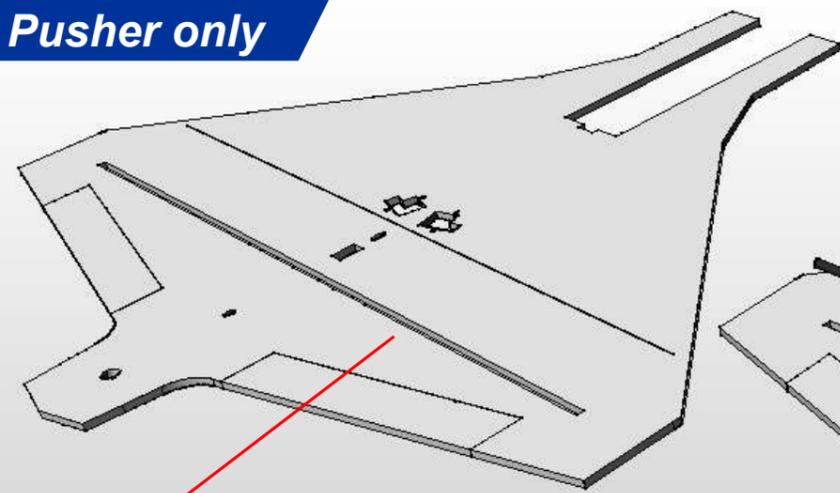


Choose your preferred variant and its powertrain.

CHOOSE POWERTRAIN



Pusher only

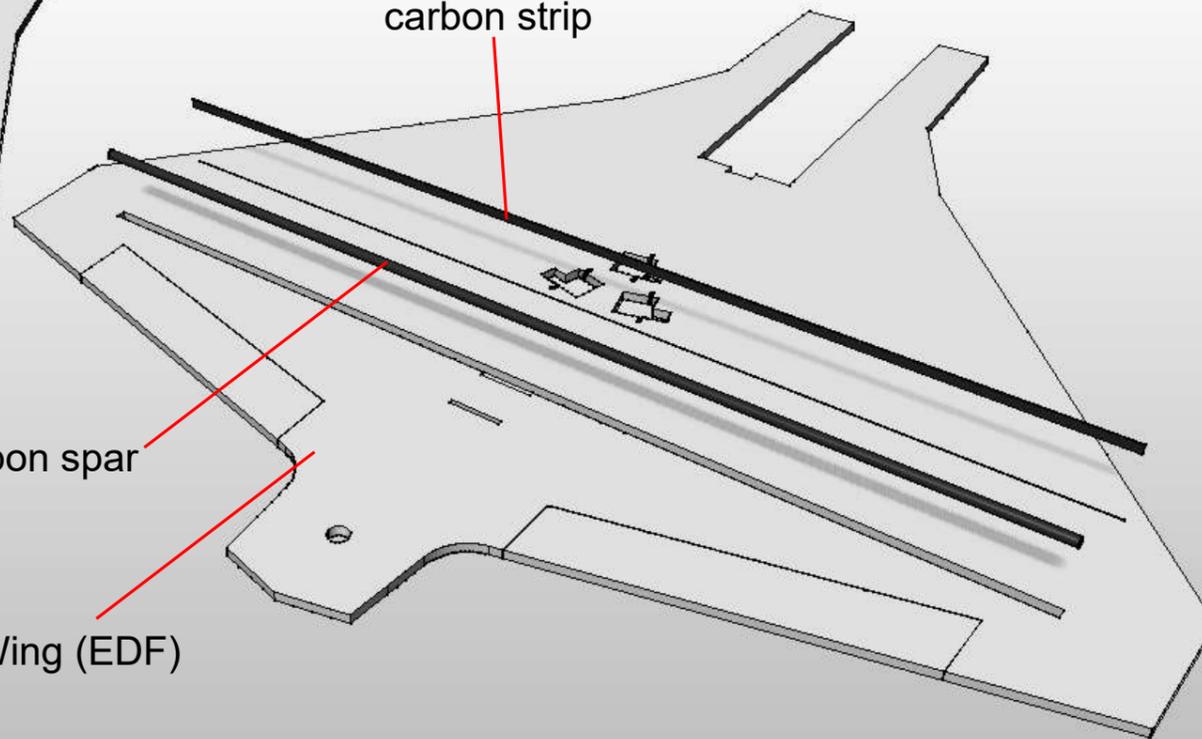


EDF only

1mm x 6mm carbon strip

6mm Carbon spar

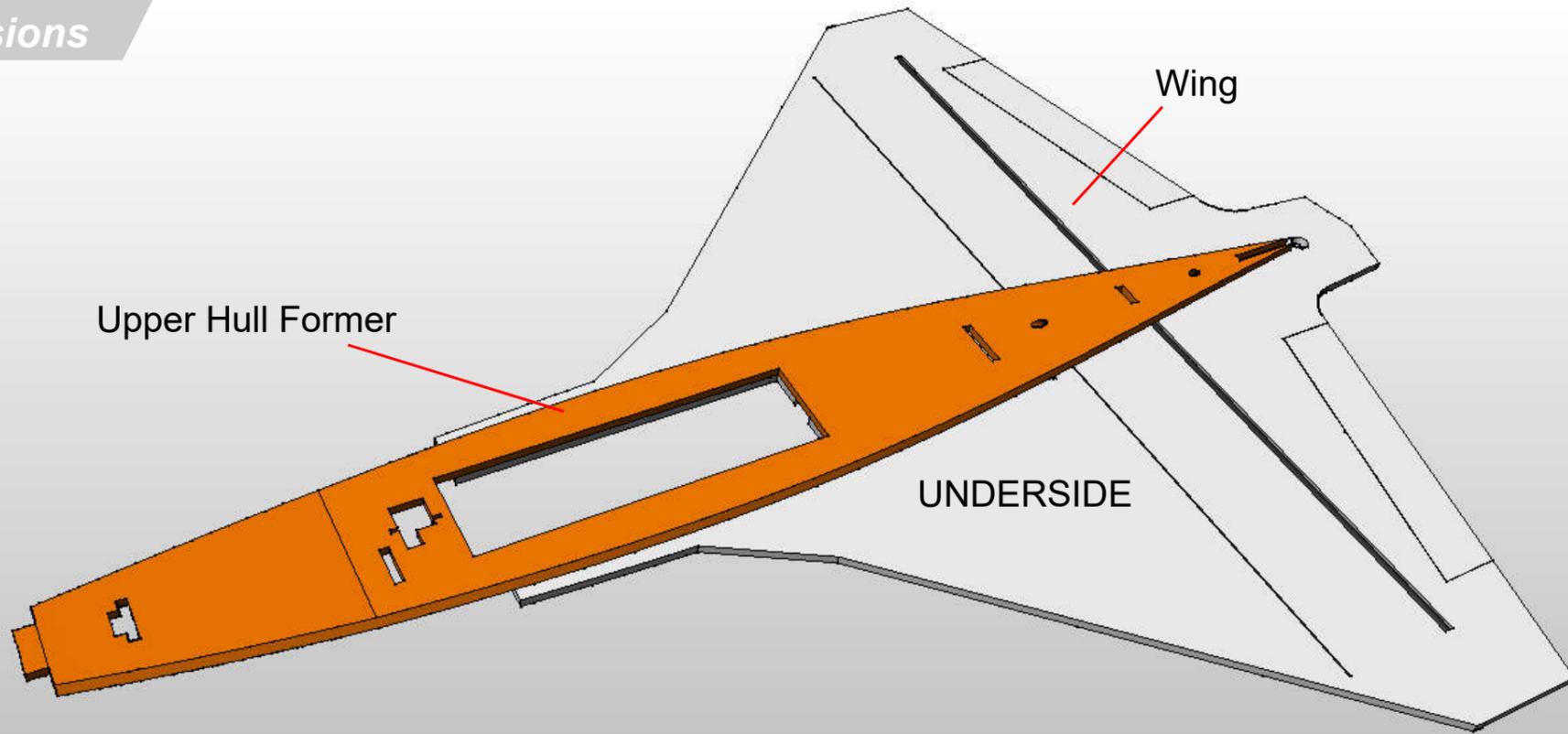
Wing (EDF)



Cut out the **Wing** according to your power choice. Glue the two carbon pieces into the wing using epoxy, utilising masking tape to get a clean finish



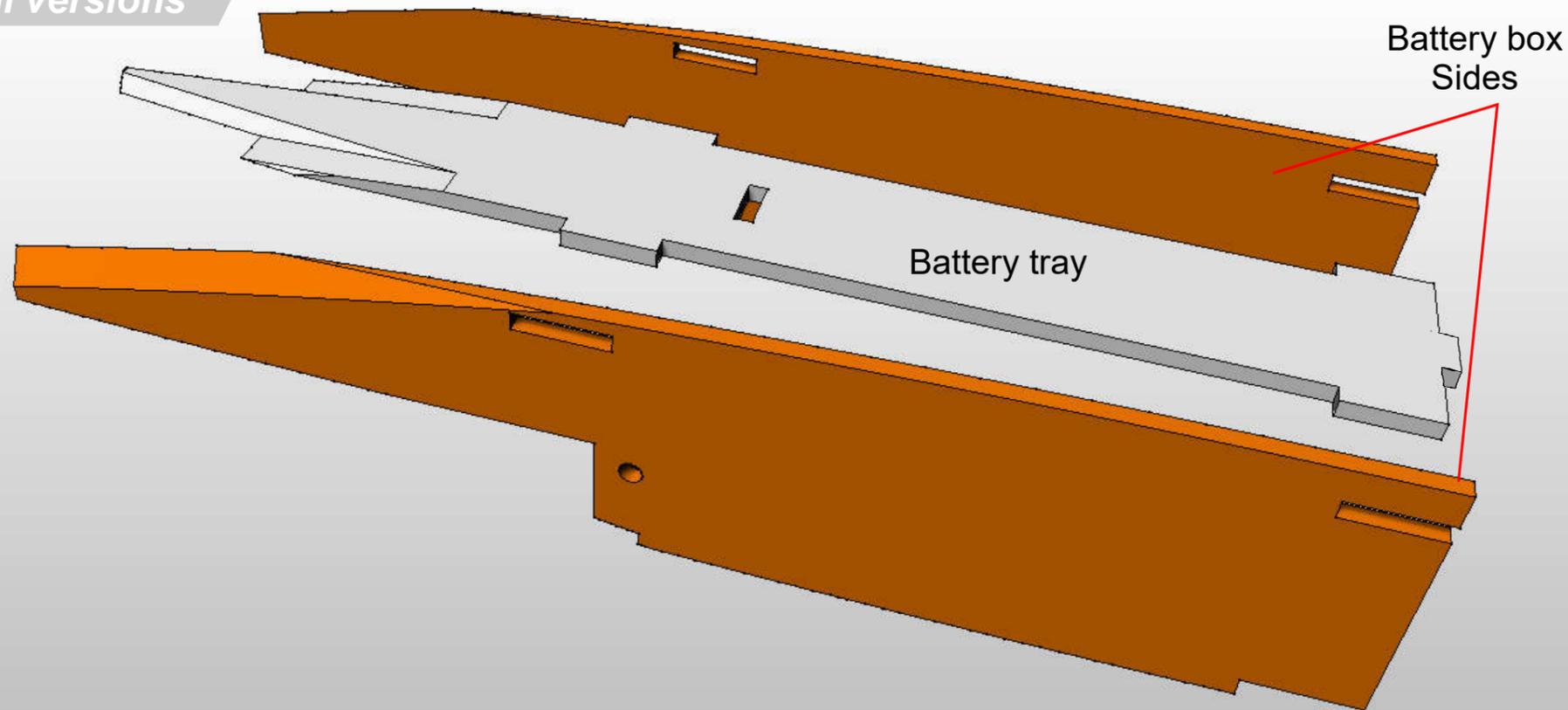
All versions



On the underside of the wing, glue the **Upper Hull Former** to the **Wing**. Use the Battery access hole to help with alignment. Ensure it is aligned on centerline.



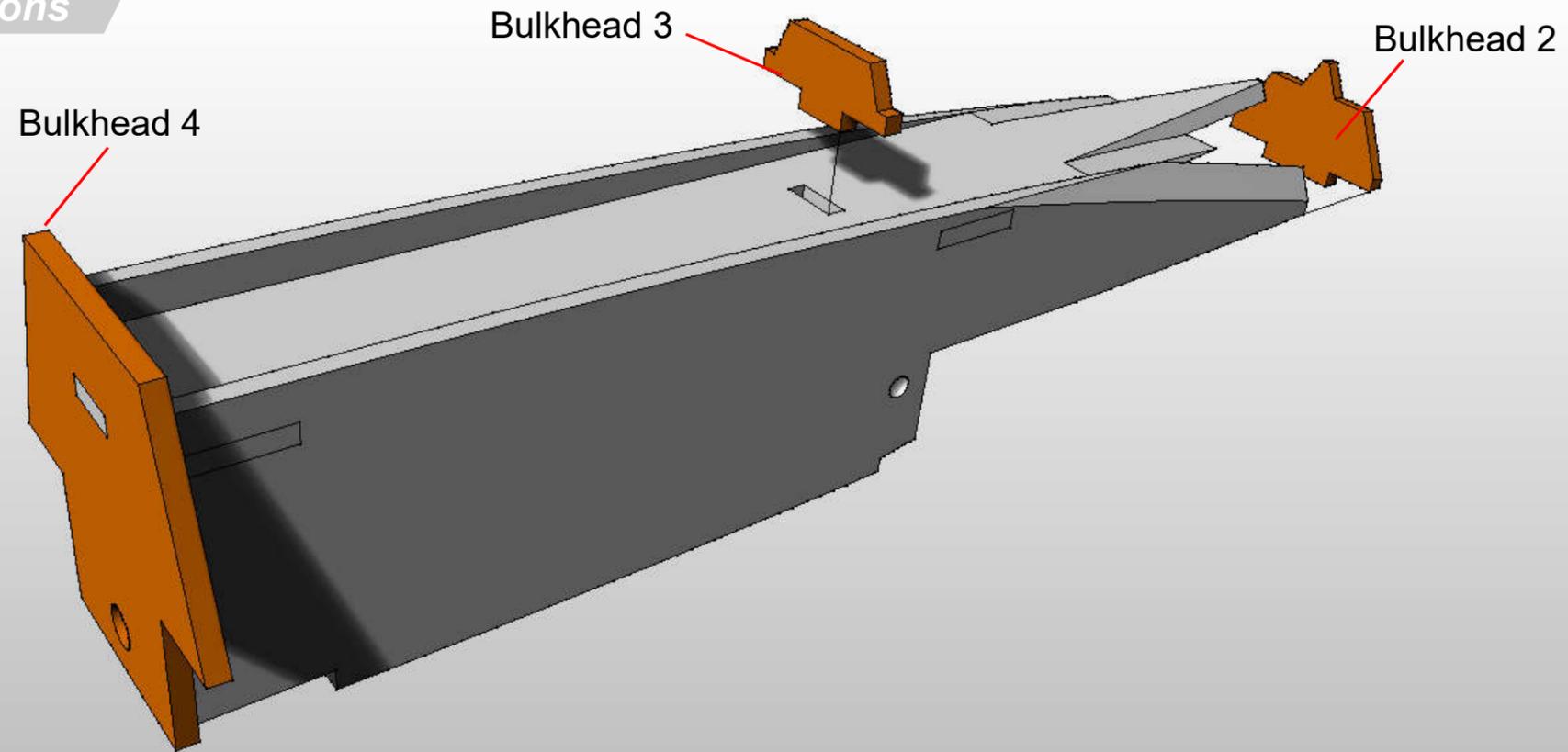
All versions



Glue the Battery box sides onto the battery tray.



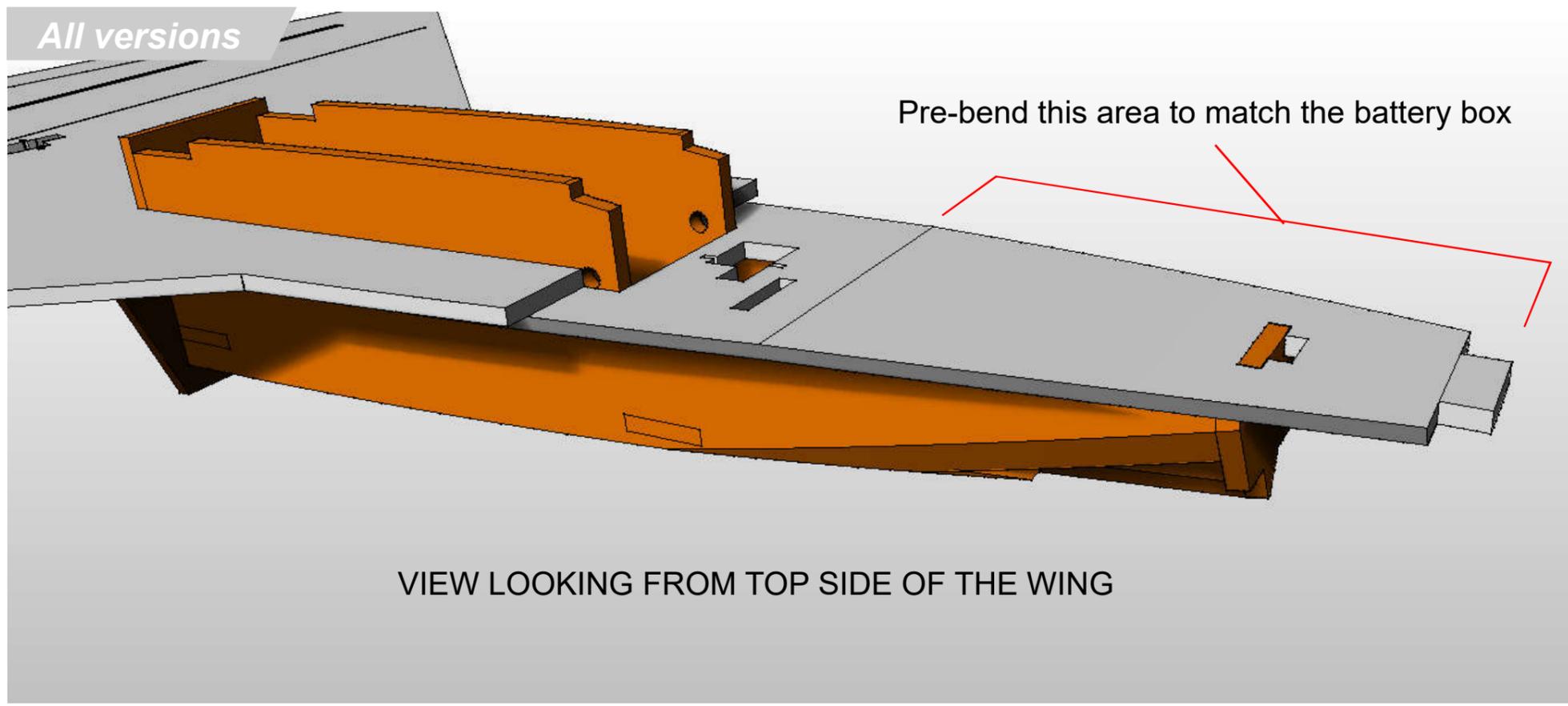
All versions



Glue the **Bulkheads** onto the battery box assembly as shown.

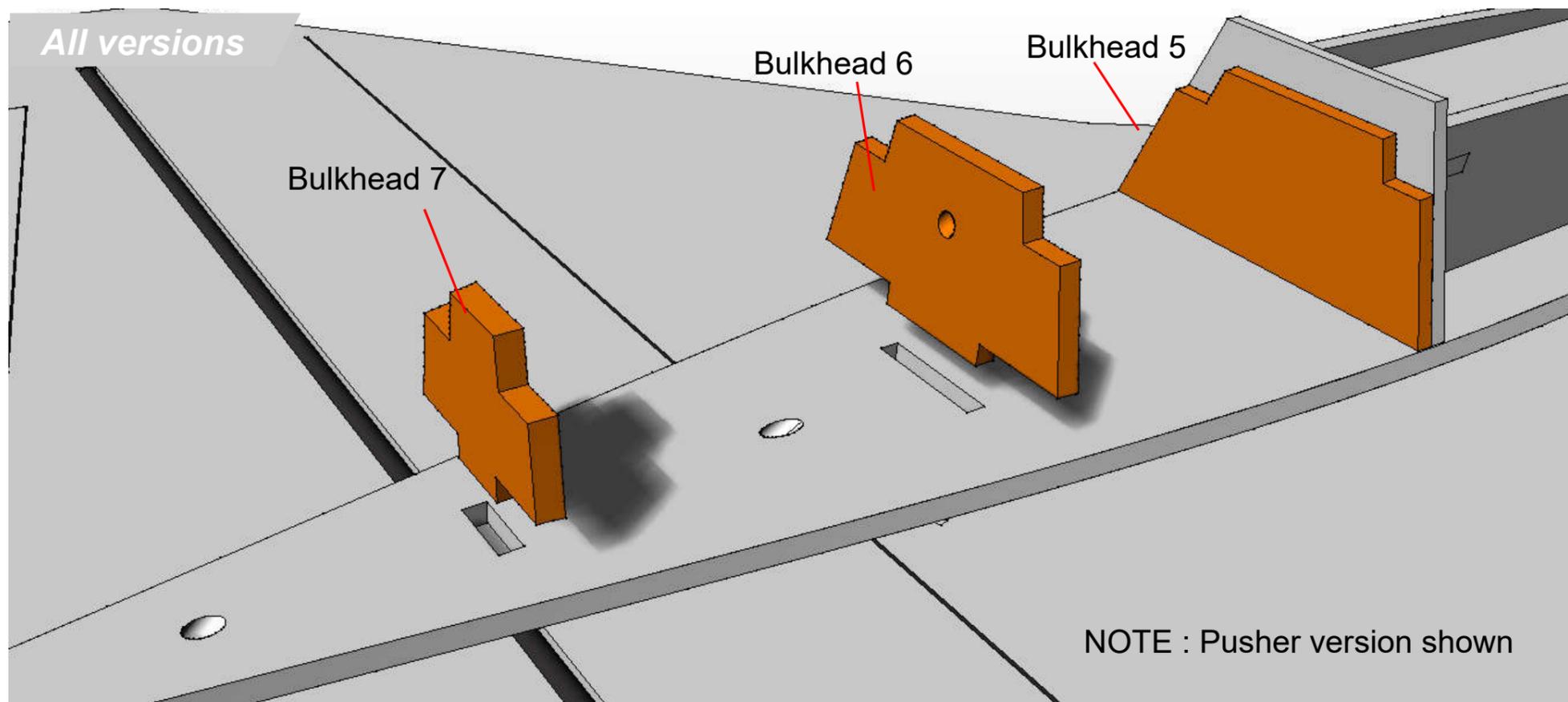


All versions

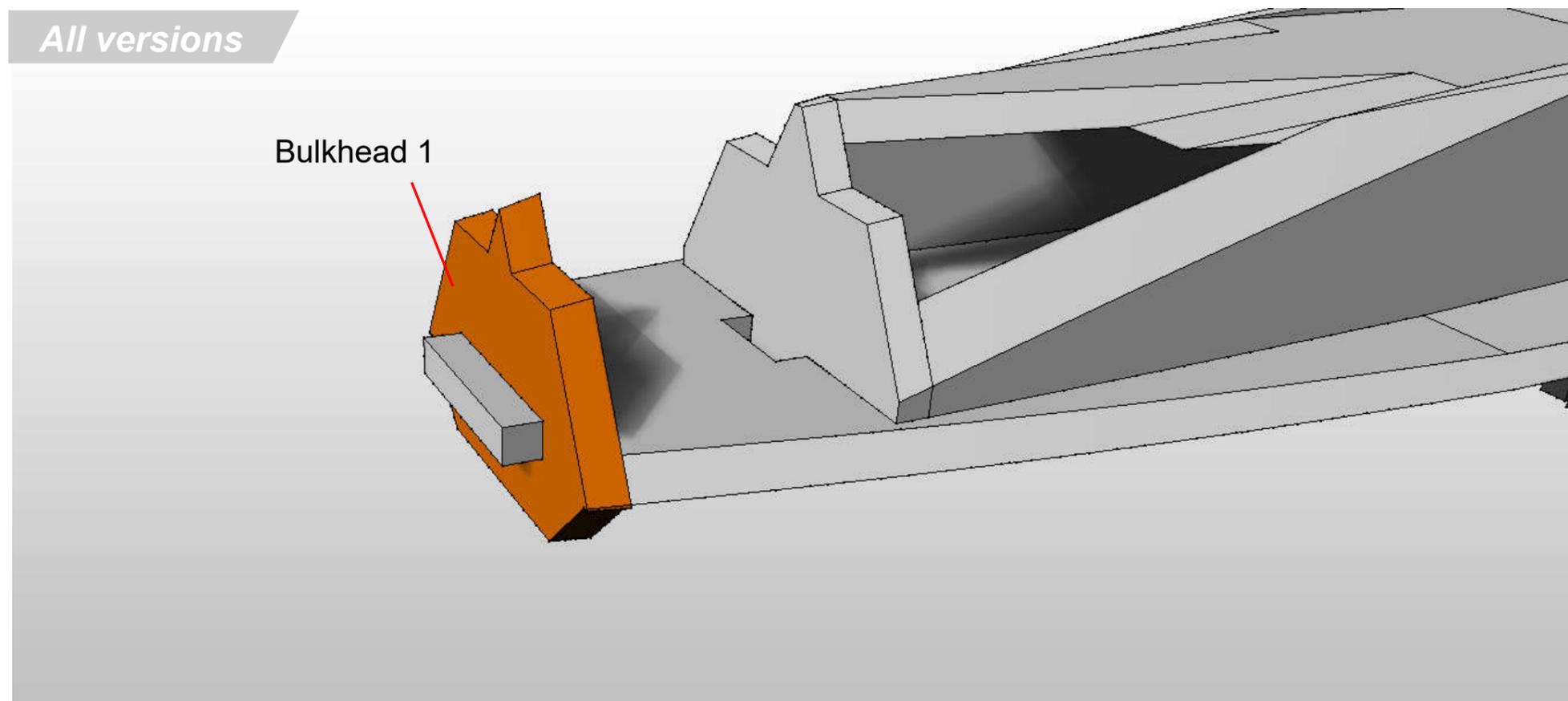


Gently pre-bend the Upper Hull former to match the shape of the battery box, then slide/glue into place.





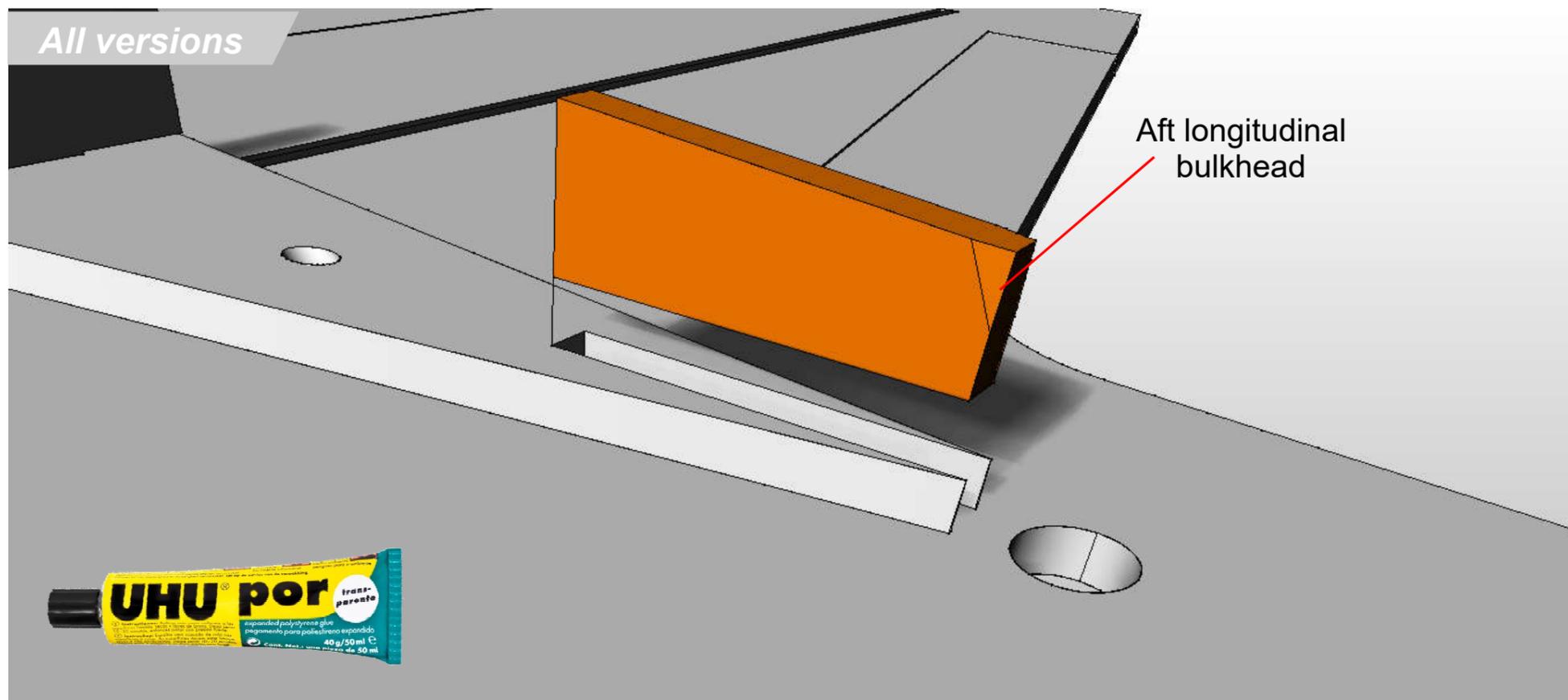
Glue the **Bulkheads** onto the Upper Hull Former



Slide **Bulkhead 1** over the tab and glue in place.



All versions



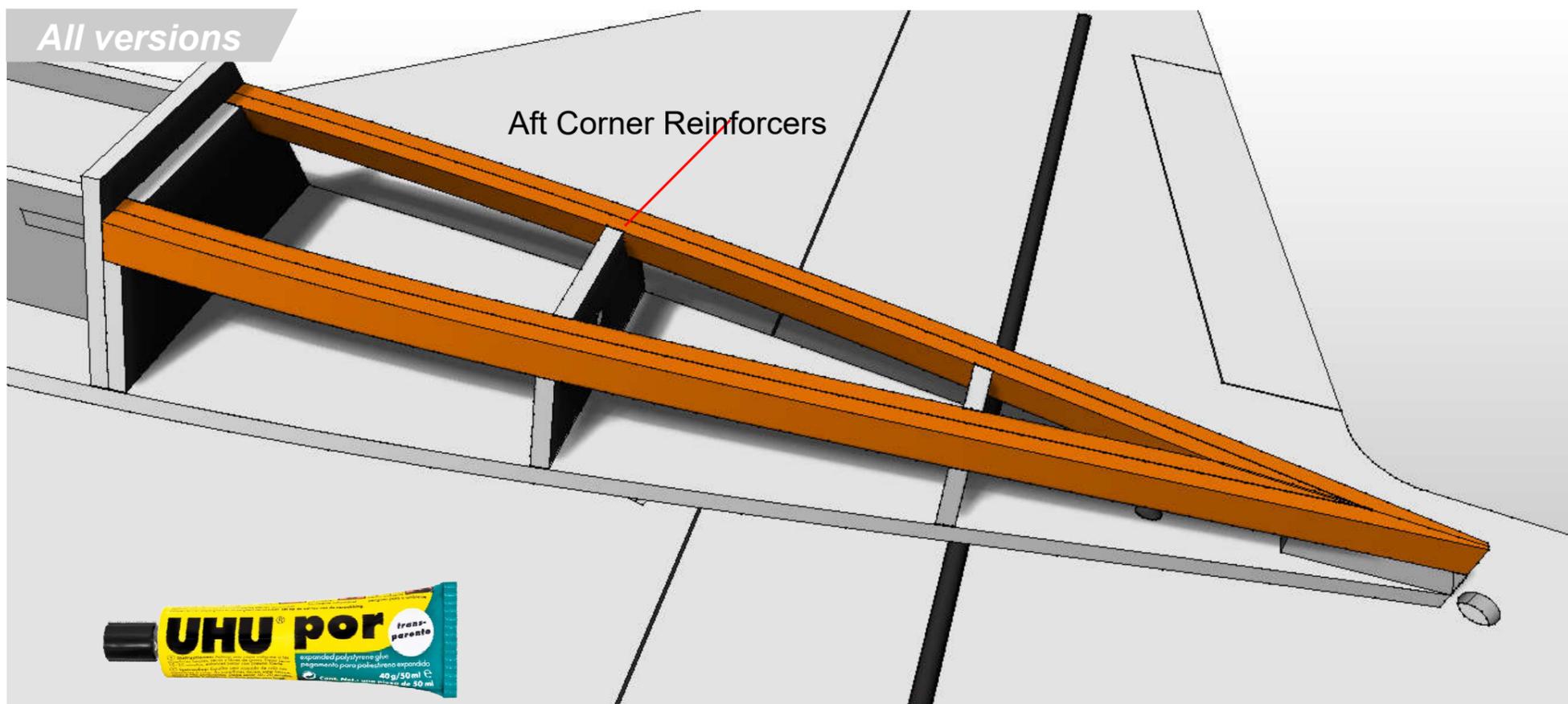
Aft longitudinal bulkhead

Glue the **Aft Longitudinal Bulkheads** into the Upper Hull Former.

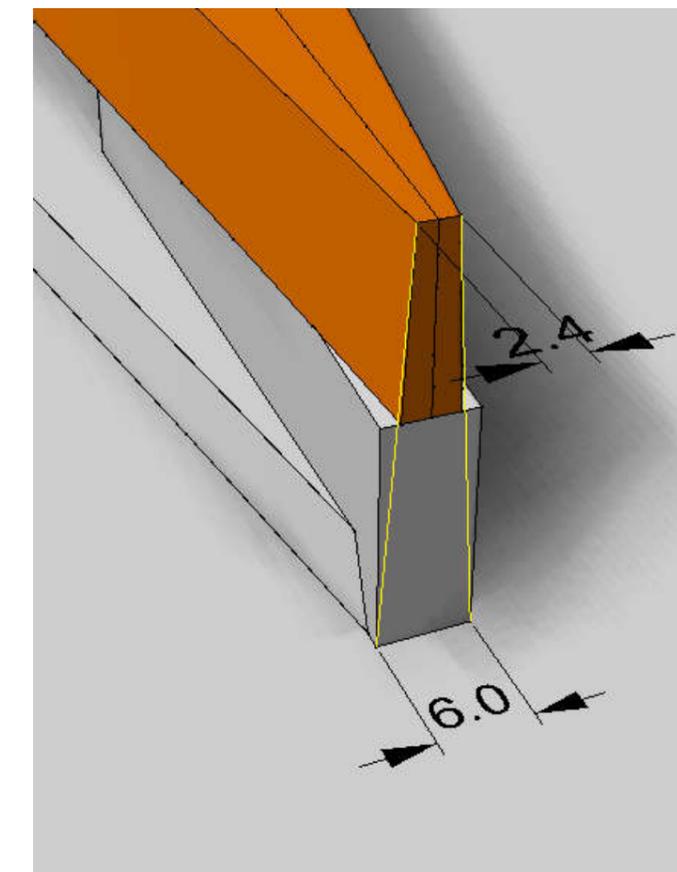
Glue the 12mm wide **Aft Corner Reinforcer Strips** together. Shape the trailing edge so that it resembles the picture below.

IMPORTANT
Carefully sand smooth using a sanding block across the bulkhead/reinforcers to enable the hull bottom to achieve a watertight join.

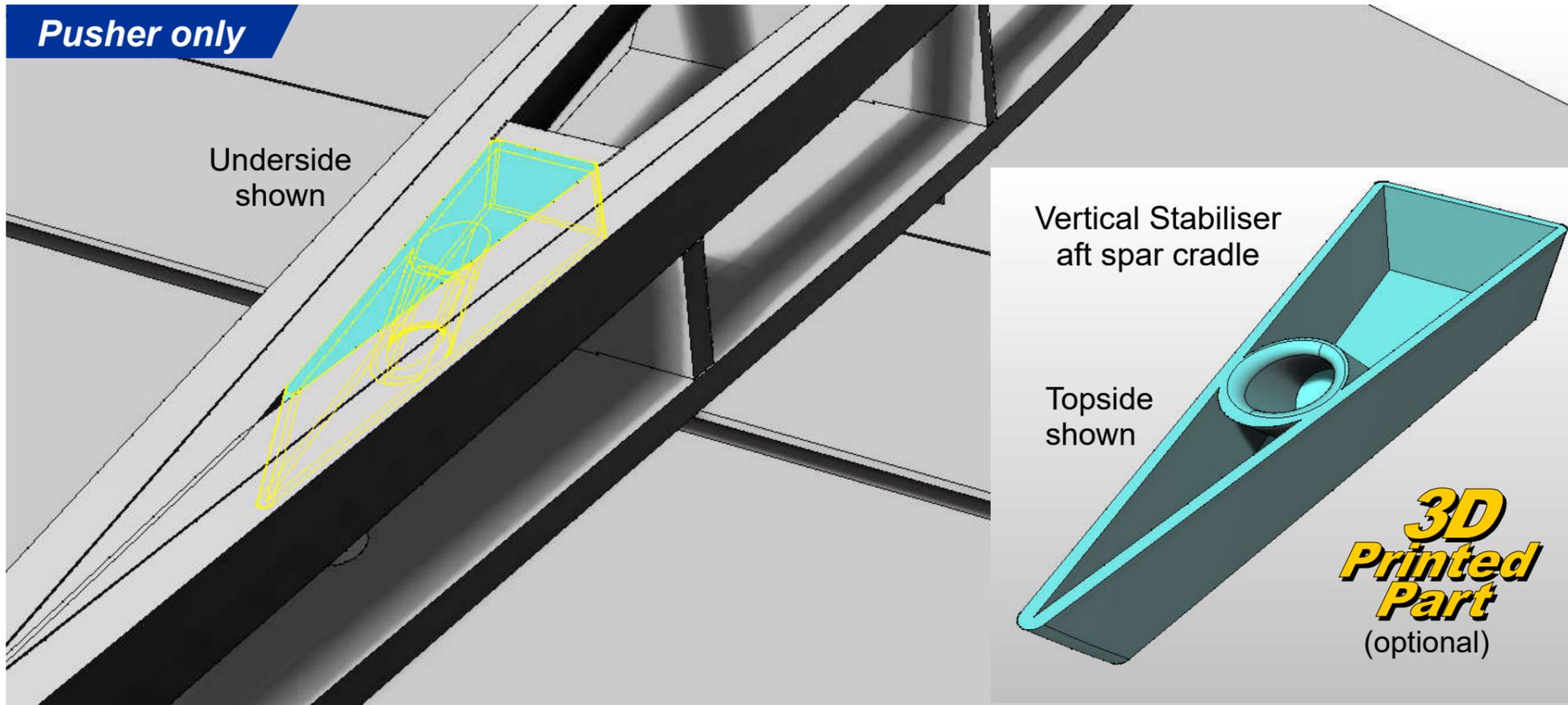
All versions



Aft Corner Reinforcers



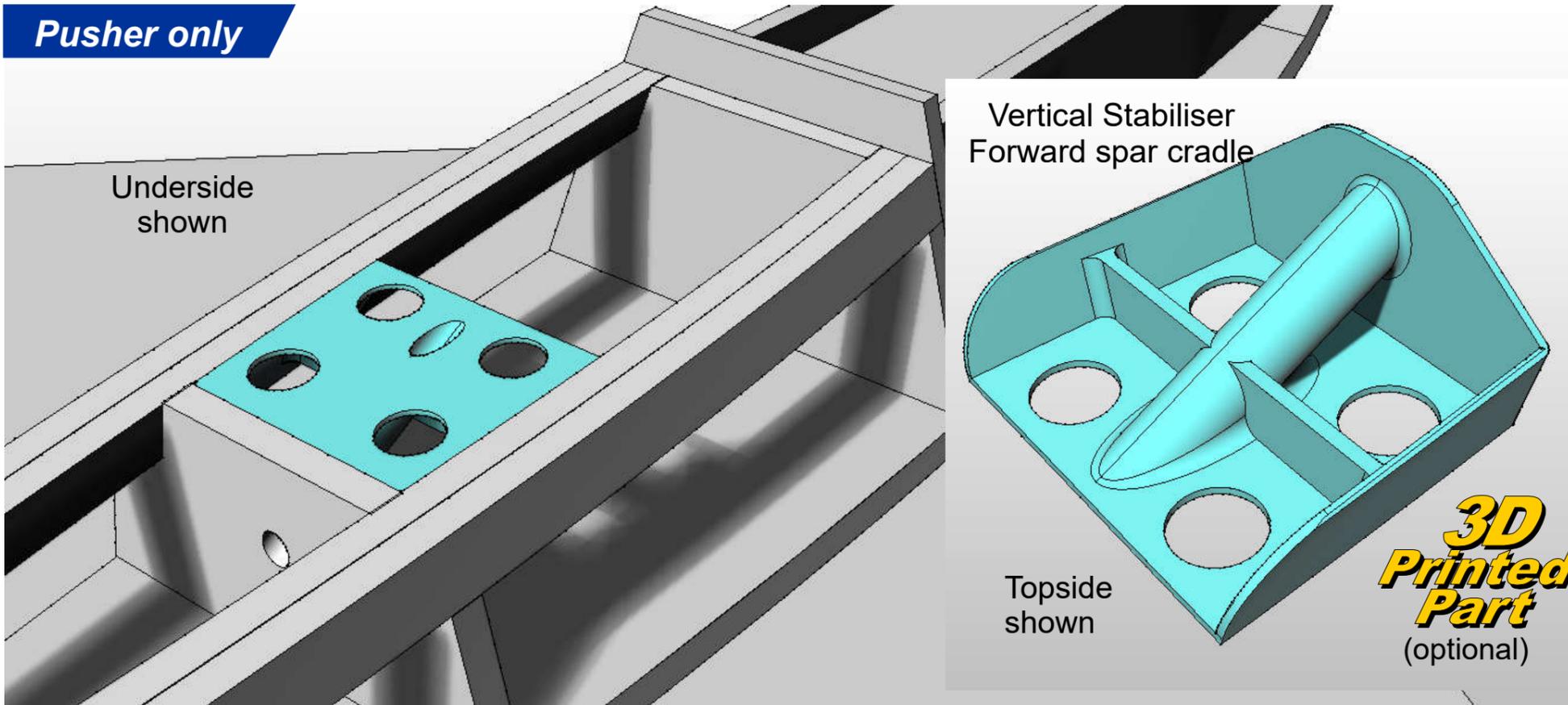
Pusher only



Glue the **Vertical Stabiliser Aft Spar Cradle** into the hole between the corner reinforcers as shown.



Pusher only

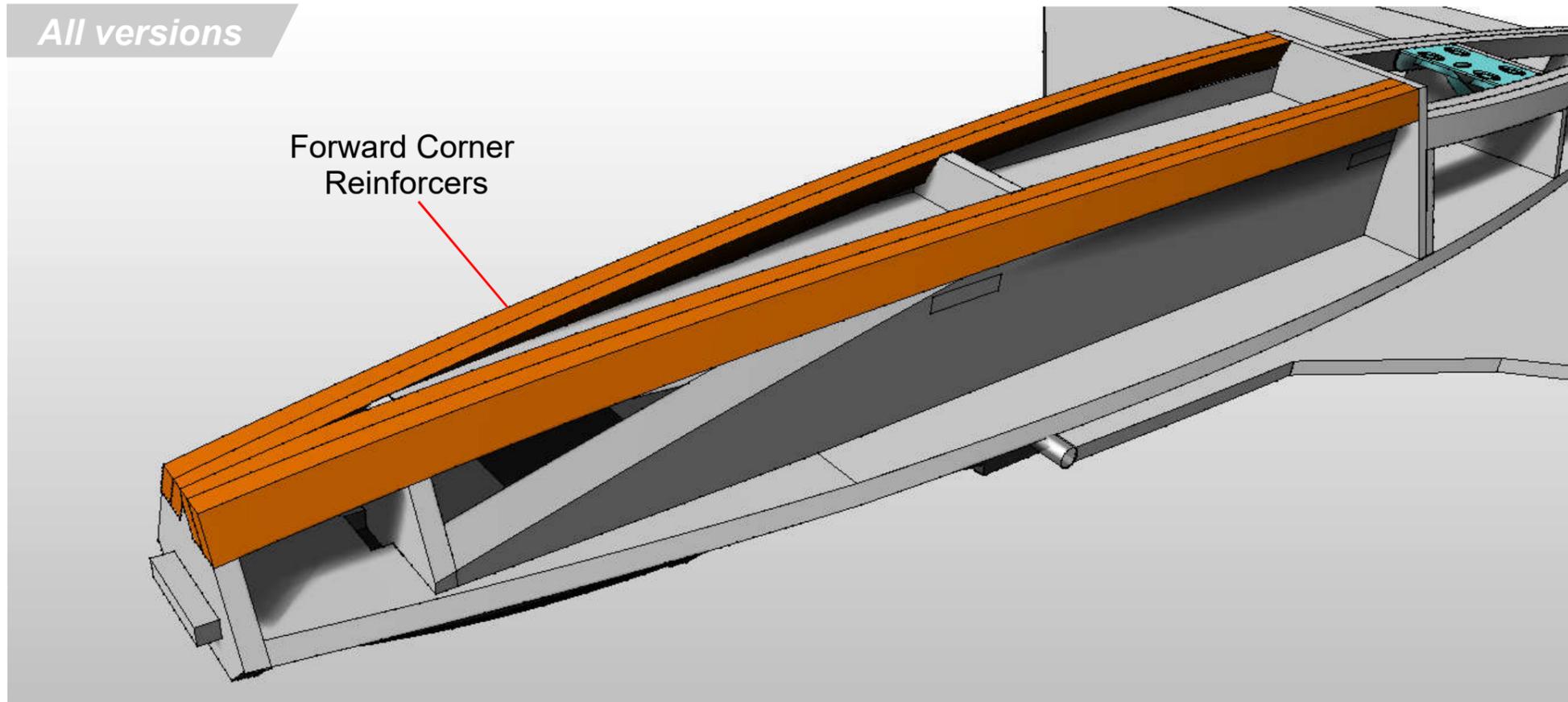


Glue the **Vertical Stabiliser Forward Spar Cradle** into the hole between the corner reinforcers as shown.

Please note there is an internal collar that will prevent the carbon spar from sliding through the cradle.



All versions



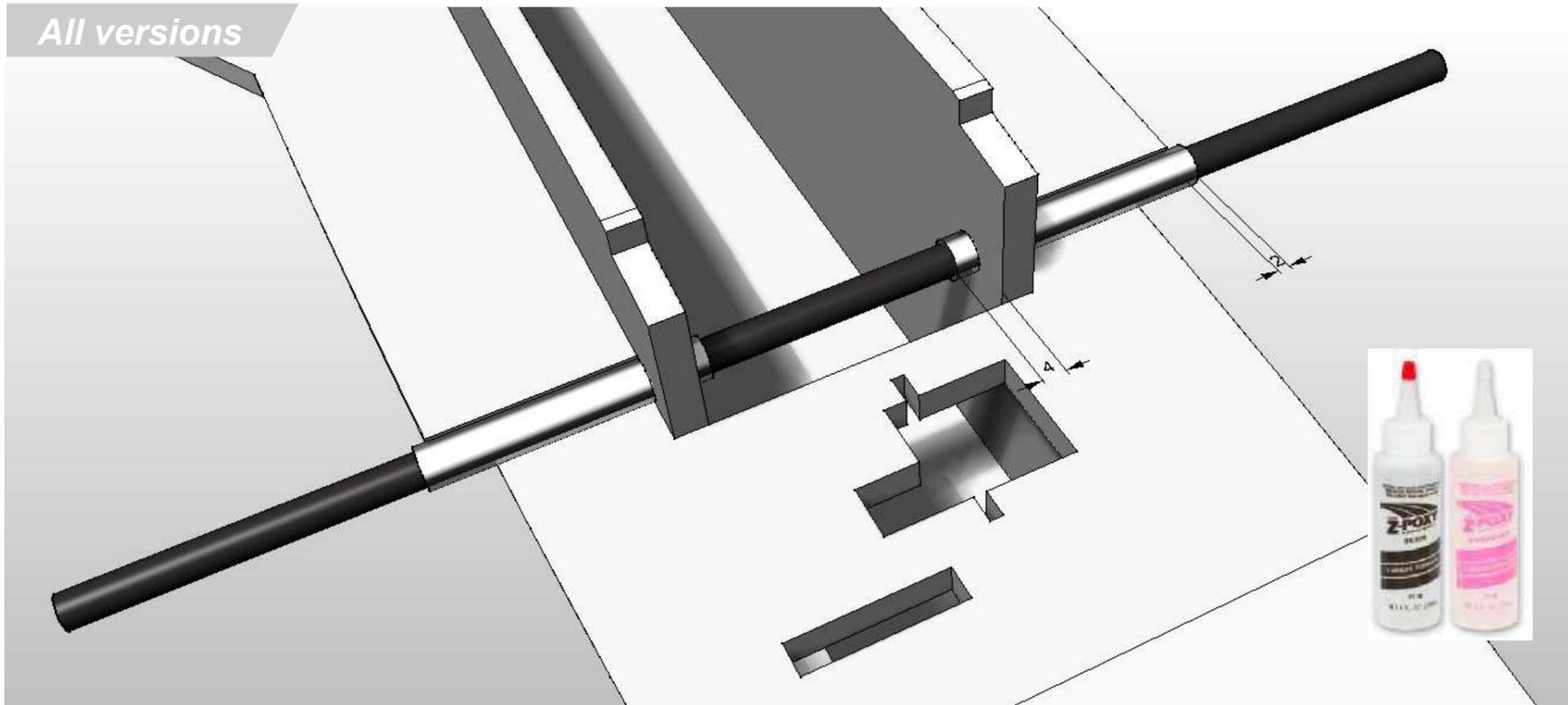
Glue the 12mm wide **Forward Corner Reinforcer Strips** together. Shape the trailing edge so that it resembles the picture below.

IMPORTANT

Carefully sand smooth using a sanding block across the bulkhead/reinforcers to enable the hull bottom to achieve a watertight joint.



All versions



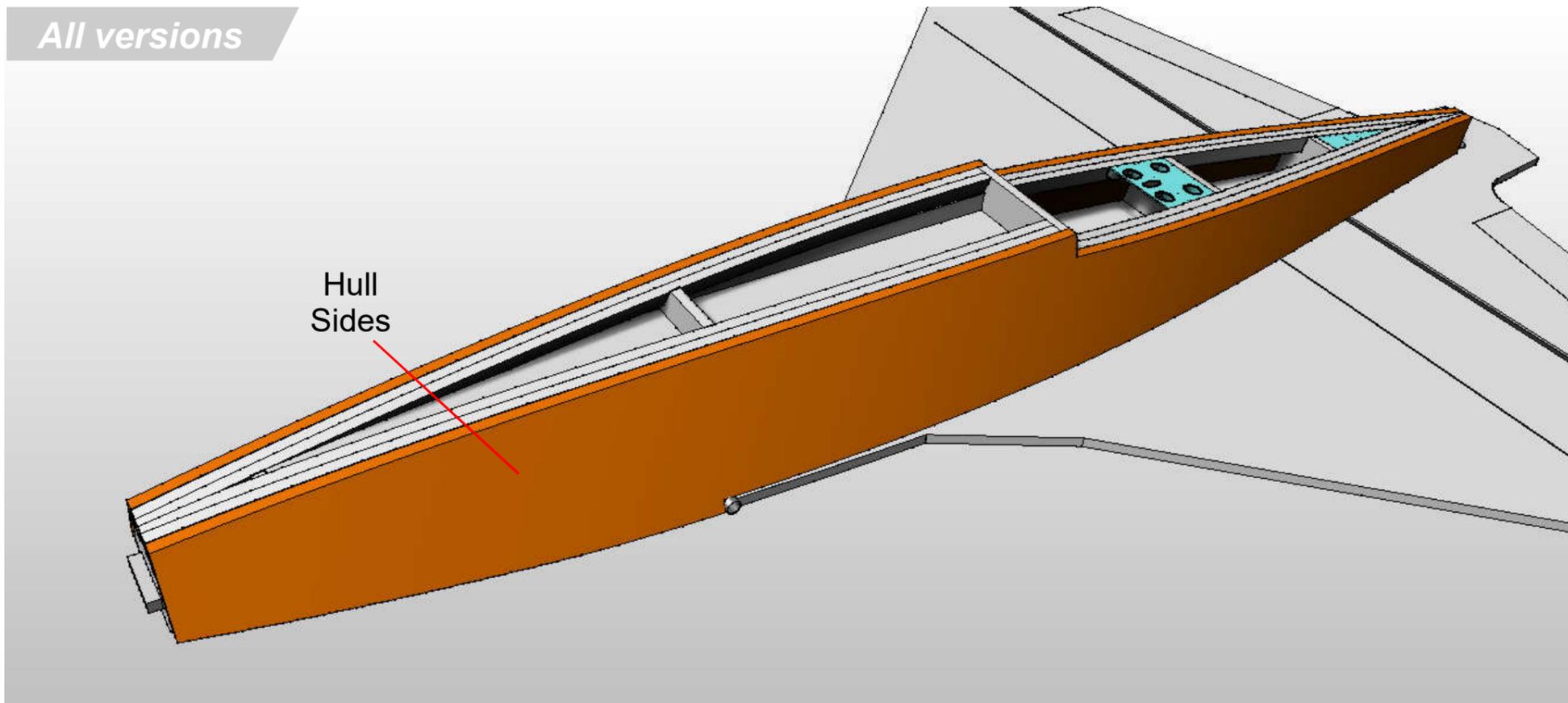
Using Epoxy, glue the two 50mm aluminium tubes as shown, protruding 2mm outside, 4mm inside.

Use a 6mm carbon spar running through to keep both tubes aligned

Prevent any glue entering the tubes by using masking tape.



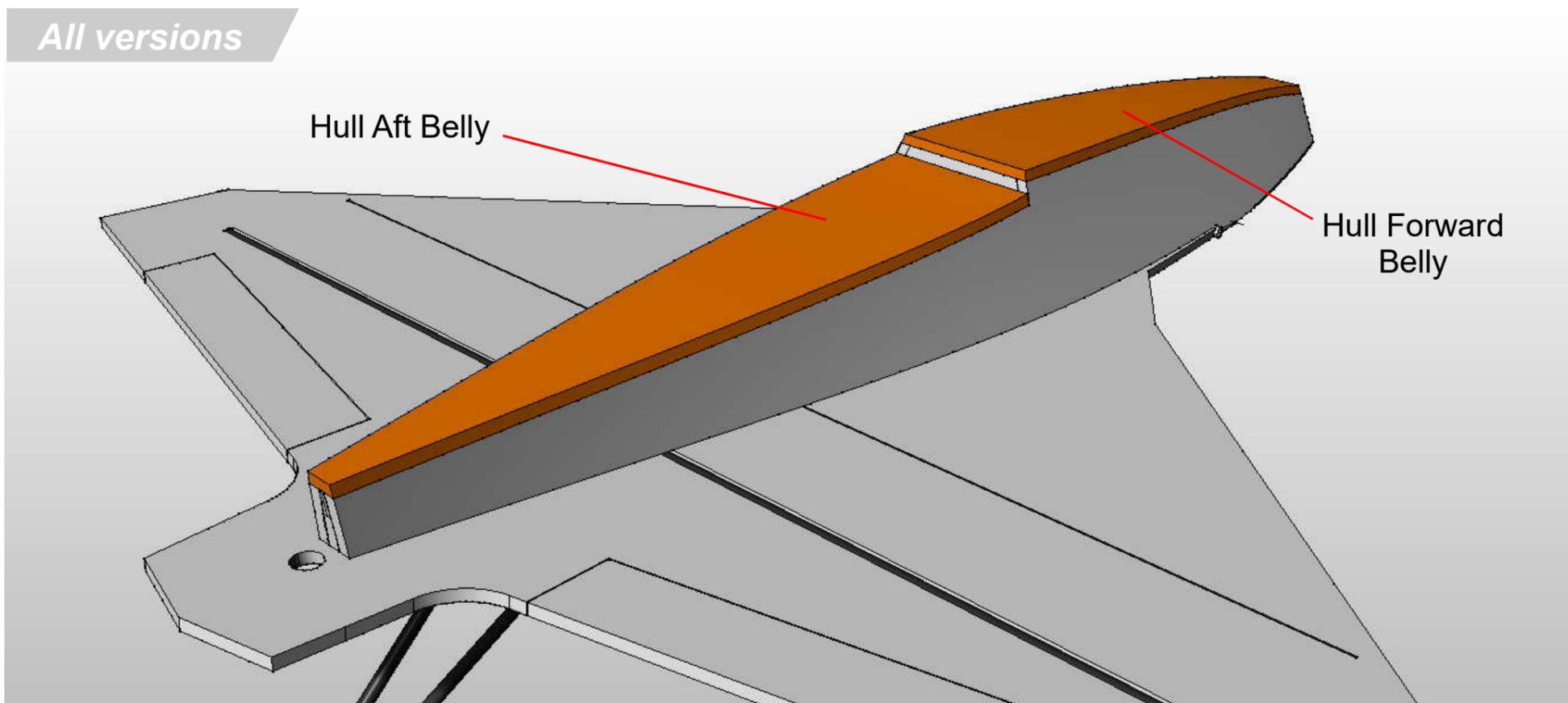
All versions



Glue the **Hull Sides** to the assembly using 30min epoxy/microballoons

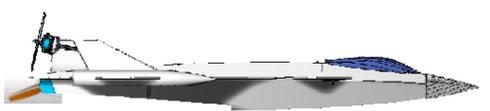


All versions

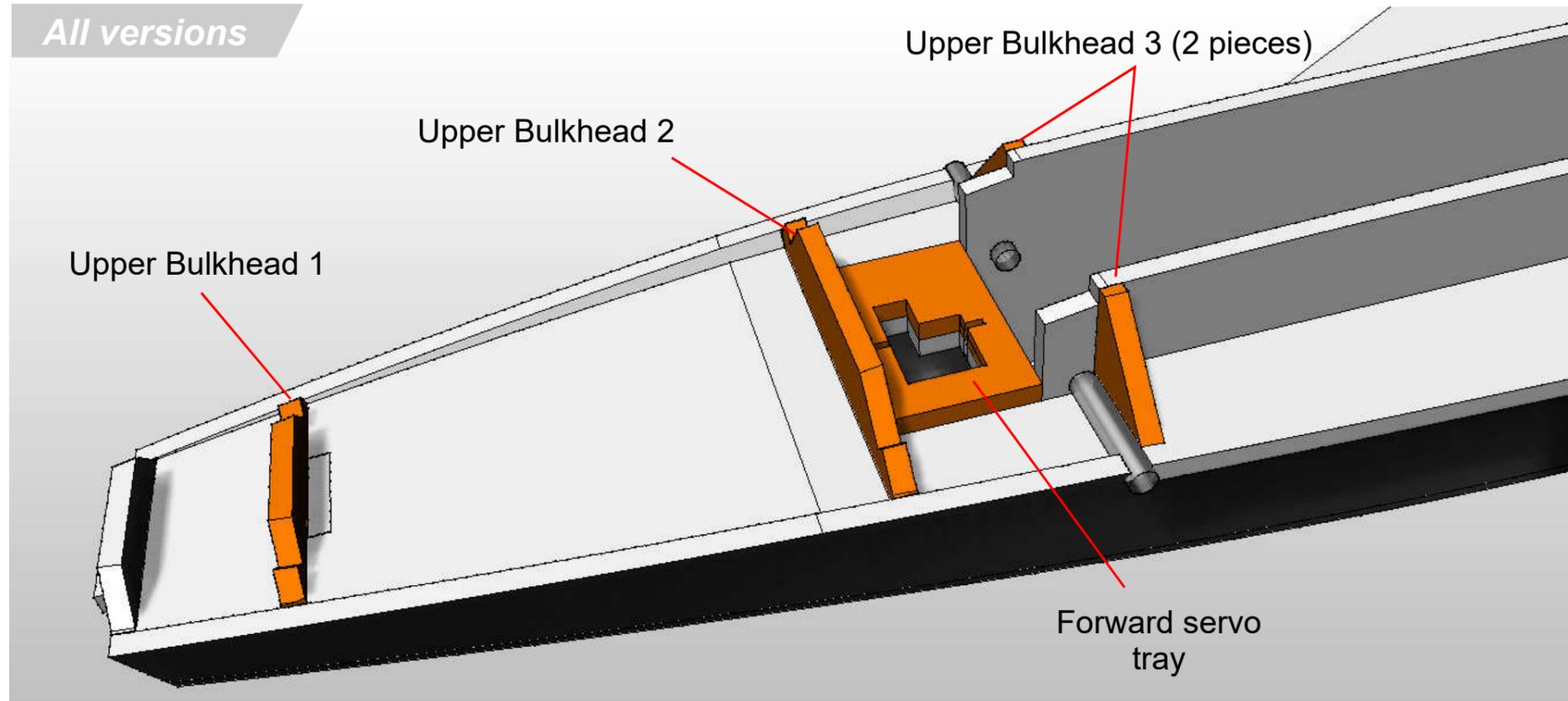


Glue the **Hull Belly's** to the assembly using 30min epoxy/microballoons.

Make watertight, and keep the epoxy mix from dribbling by using Masking tape along the seams.



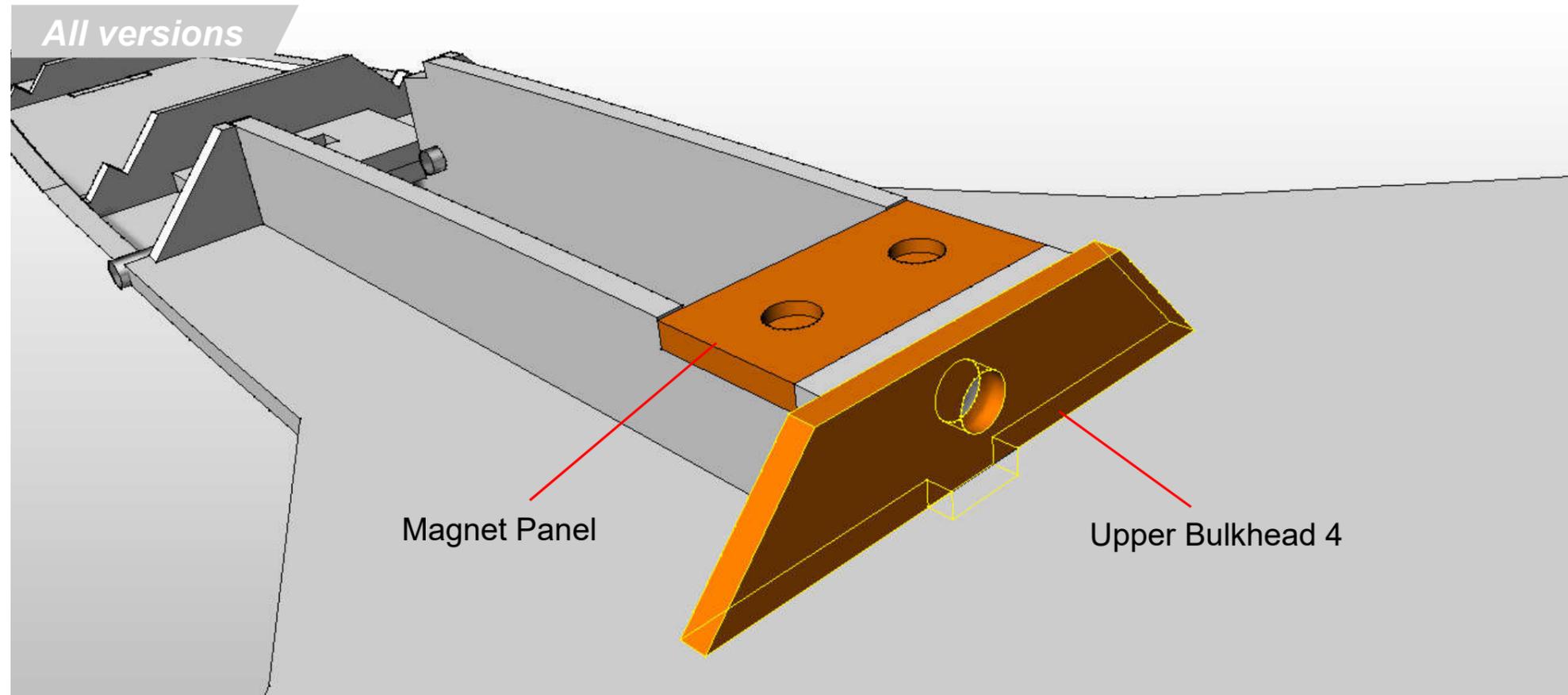
All versions



Glue the **Upper bulkheads** and **Forward Servo Tray** onto the fuselage.



All versions

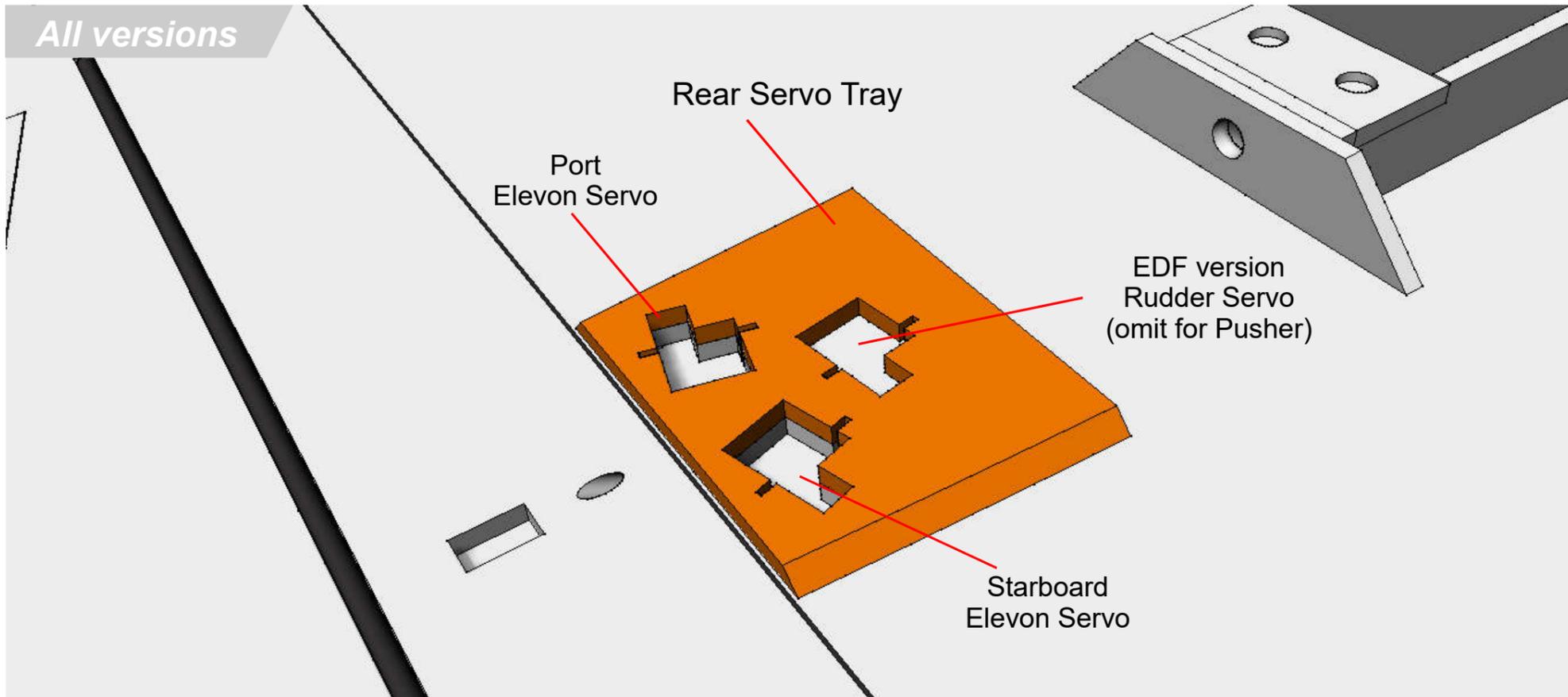


Glue the **Magnet panel** and **Upper Bulkhead** to the fuselage.

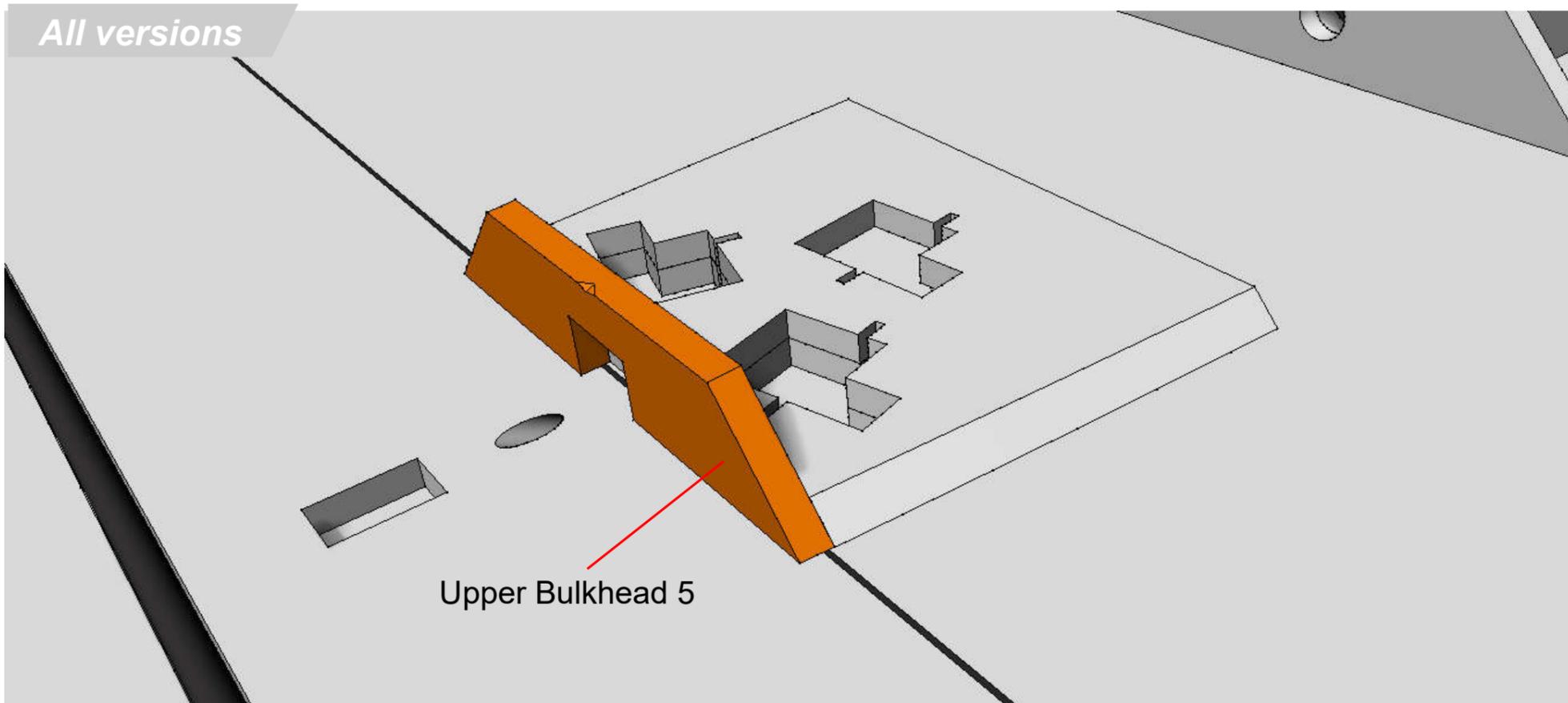


DRAKE III





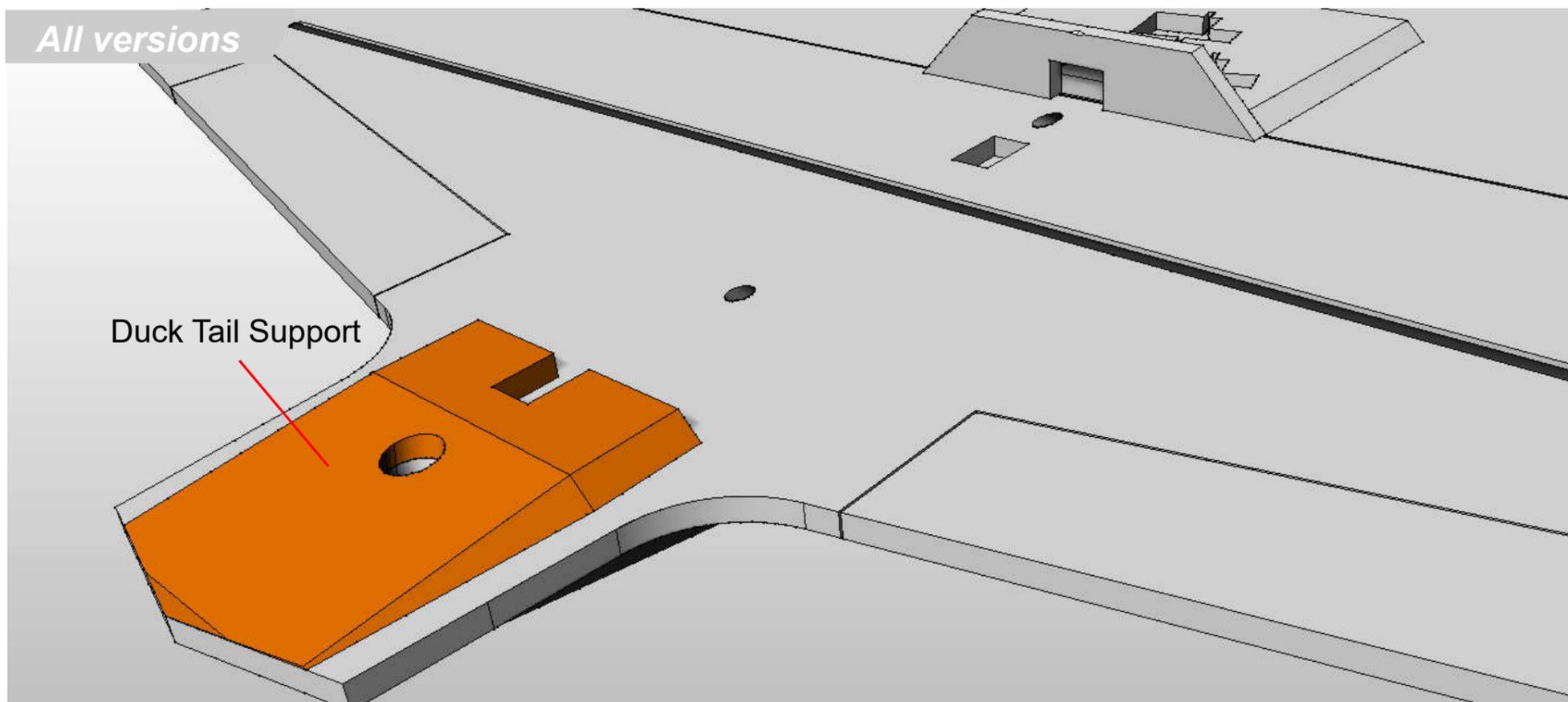
Glue the **Aft Servo Tray** onto the fuselage - aligning to the previously cut out servo holes.



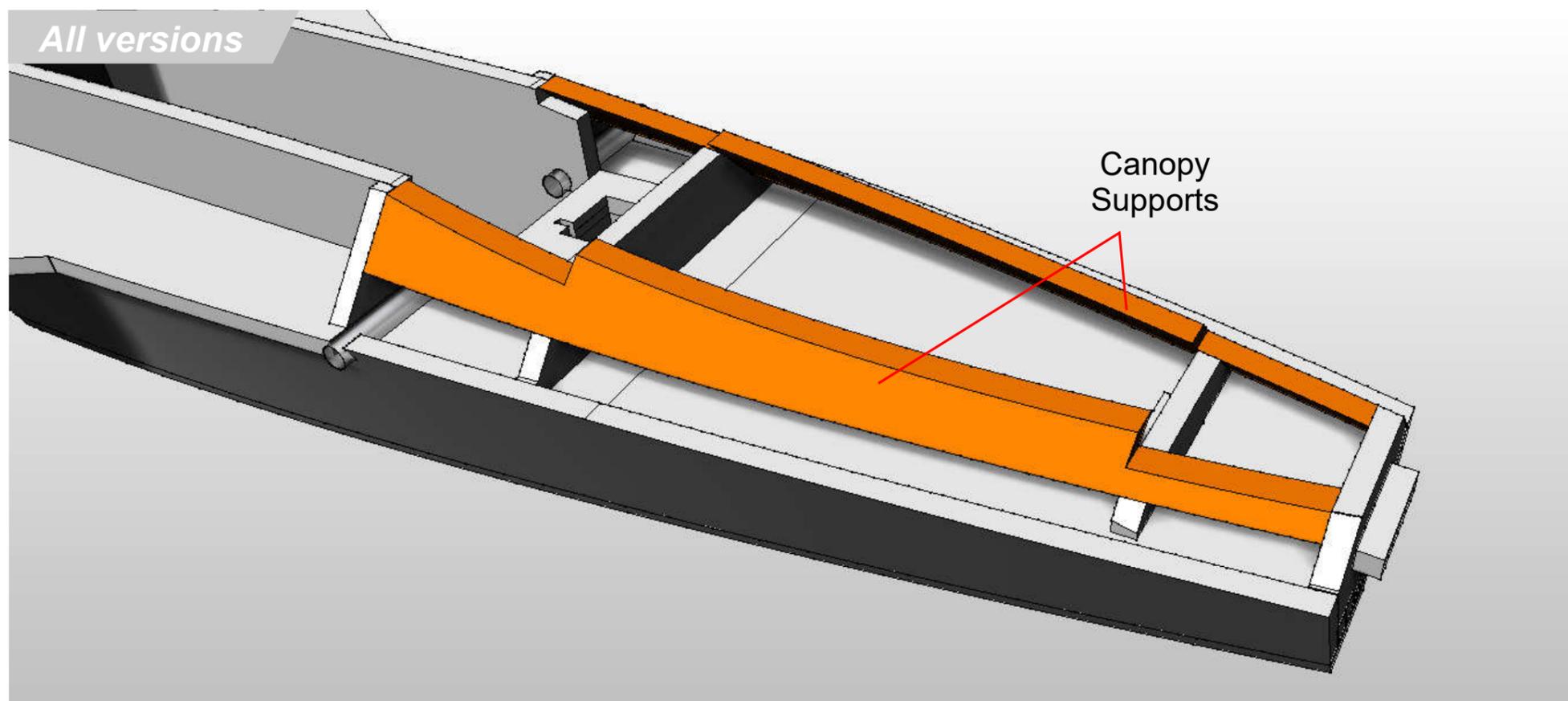
Glue **Upper Bulkhead 5** onto the fuselage using the servo tray to align to.

It may be worth you measuring against the fuselage centreline to ensure no misalignment.





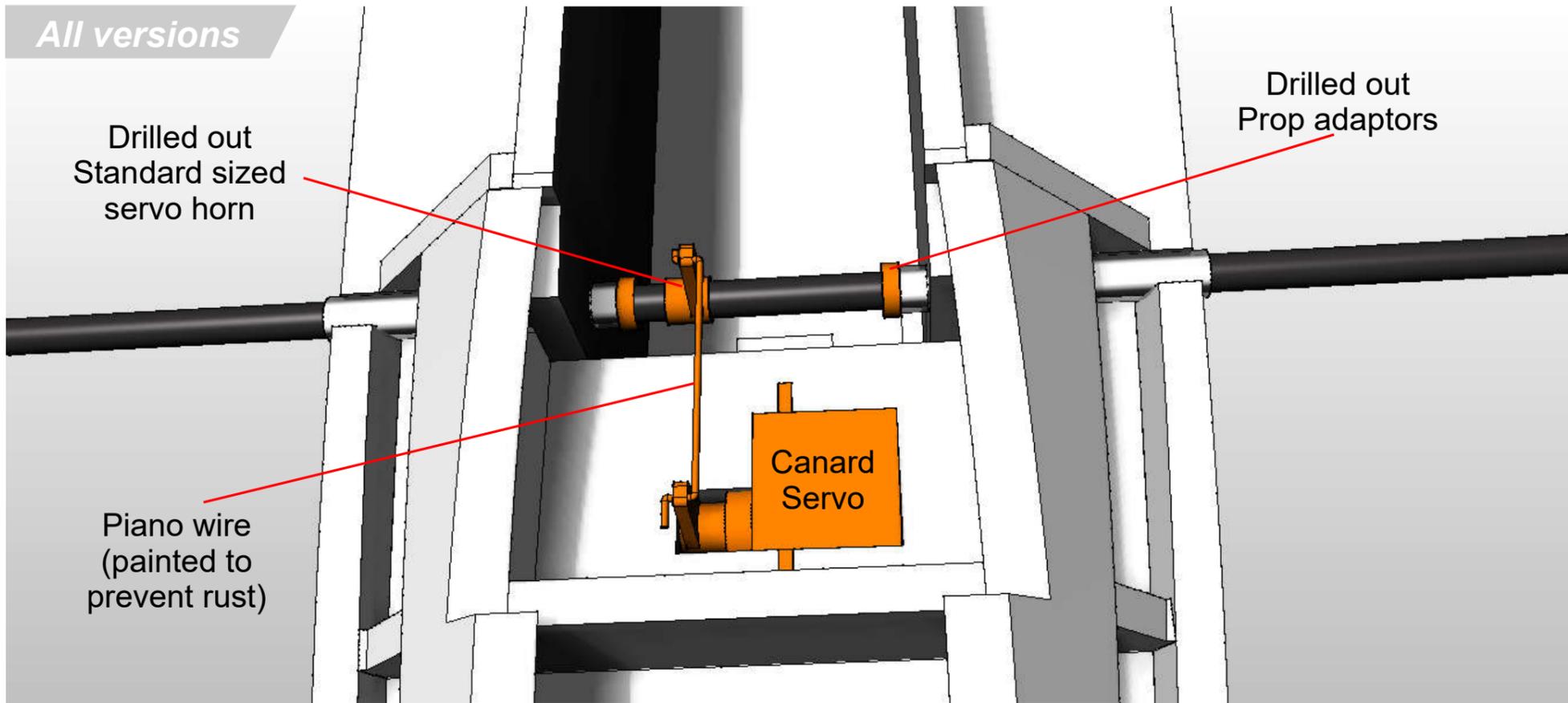
Glue the **Aft Servo Tray** onto the fuselage - aligning to the previously cut out servo holes / centreline.



Pre-Curve and glue the **Canopy Supports** to the fuselage.



All versions

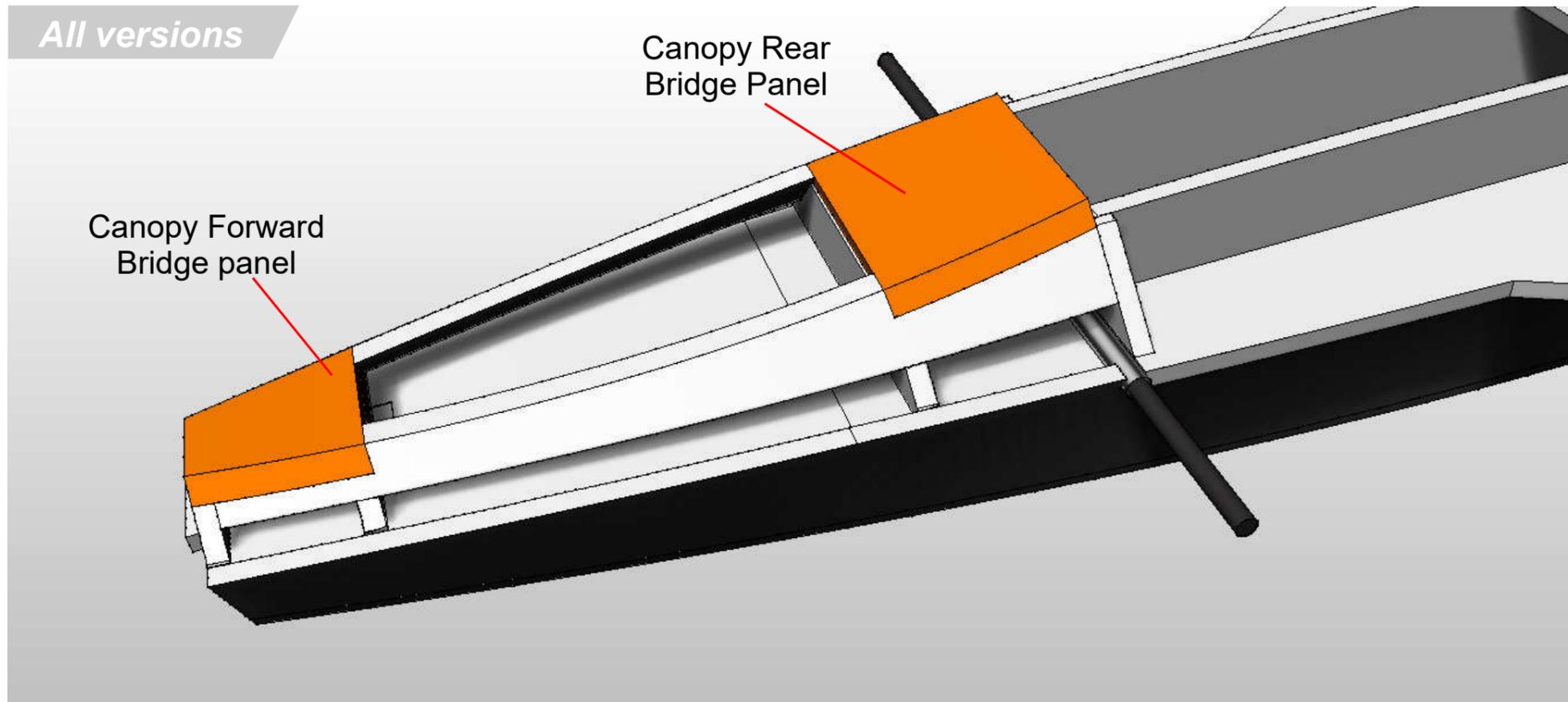


Glue the Canard Servo into the tray using hot melt glue.

Set up the arrangement as shown, using CA Glue to fix the horn to the carbon spar.

Use the drilled out prop adaptors to act as bushes/travel limiters held in place using friction.

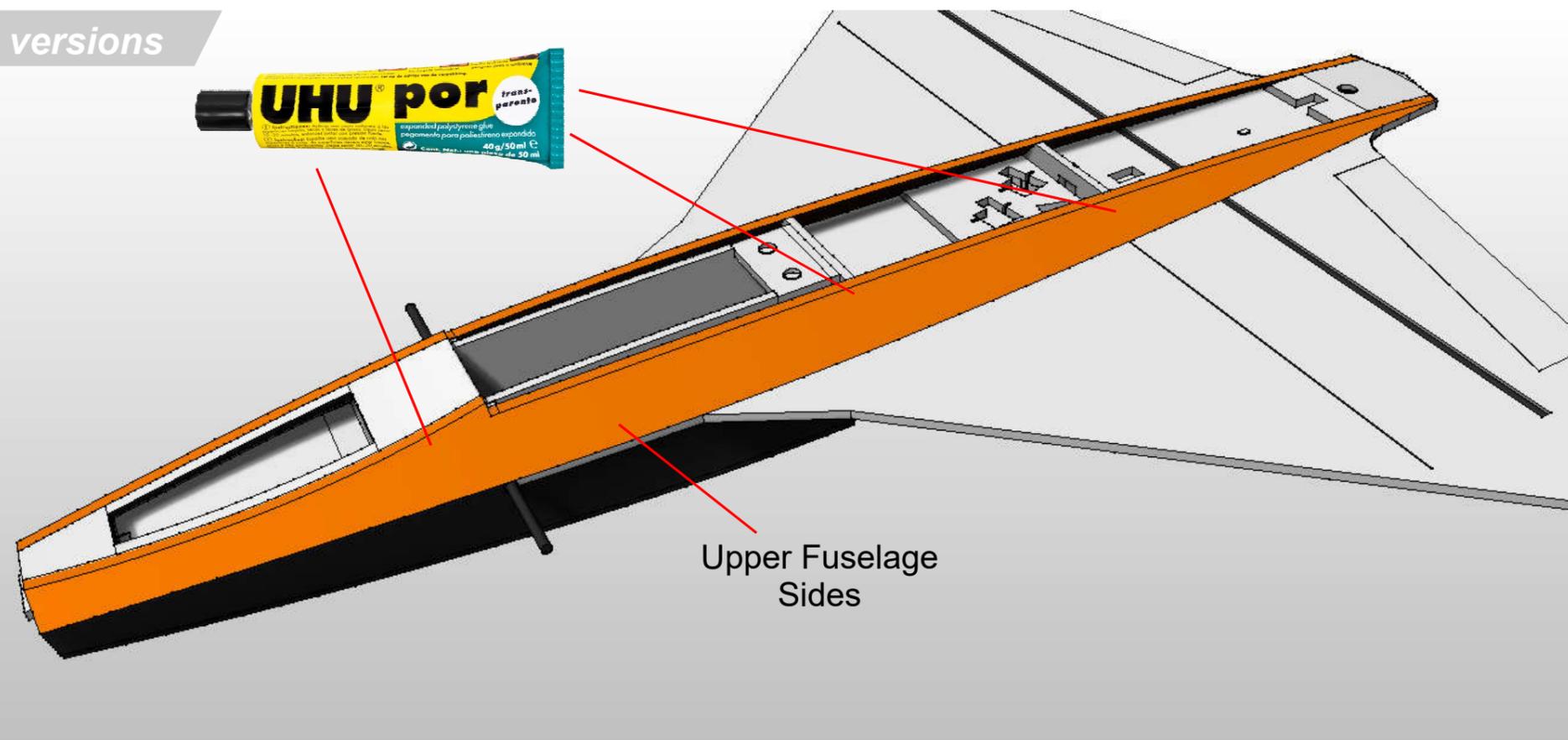
All versions



Glue the **Bridge Panels** to the fuselage.



All versions



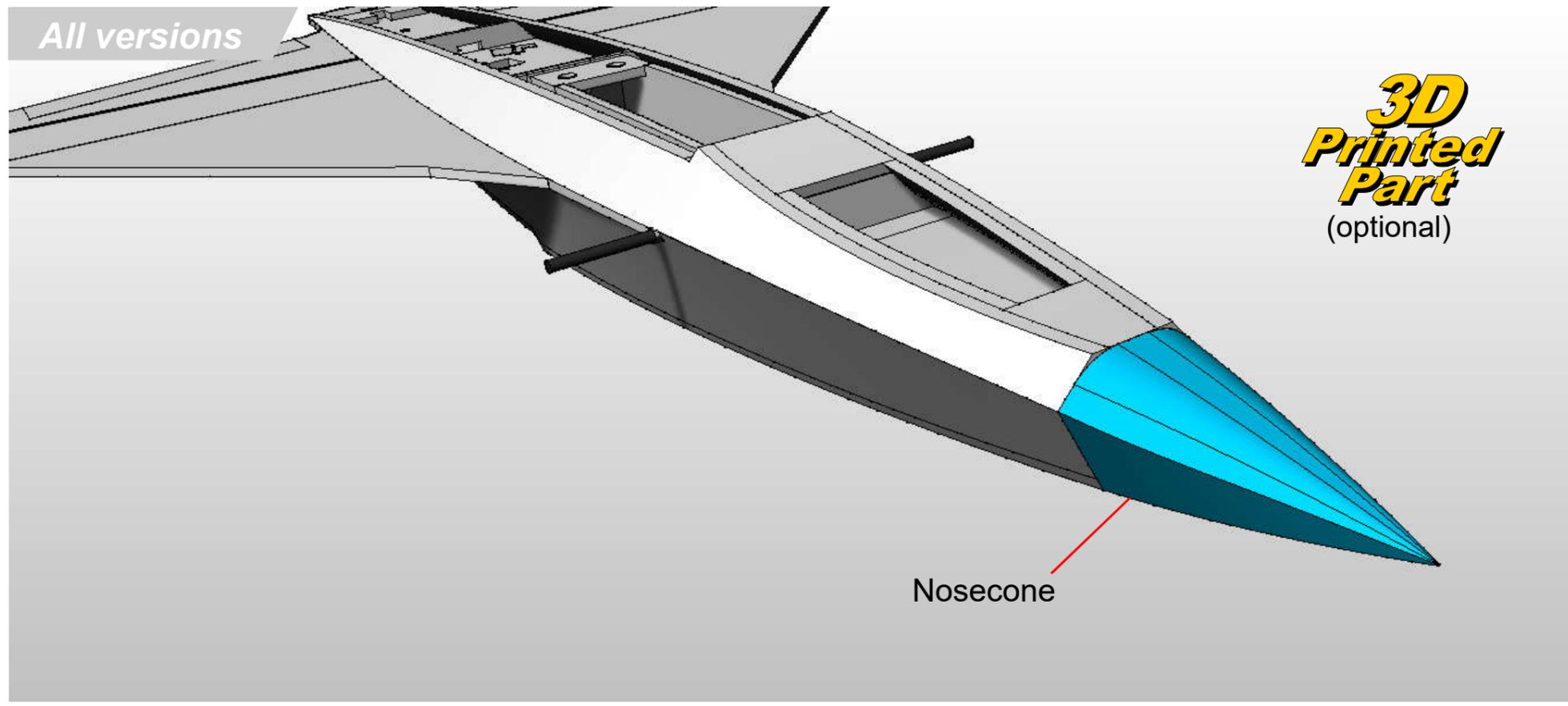
Upper Fuselage Sides

Glue the **Upper fuselage sides** in place.

Use UHU Por on the upper bulkhead/canopy supports and Epoxy/Microballoons on lower edges, to prevent water ingress.



All versions



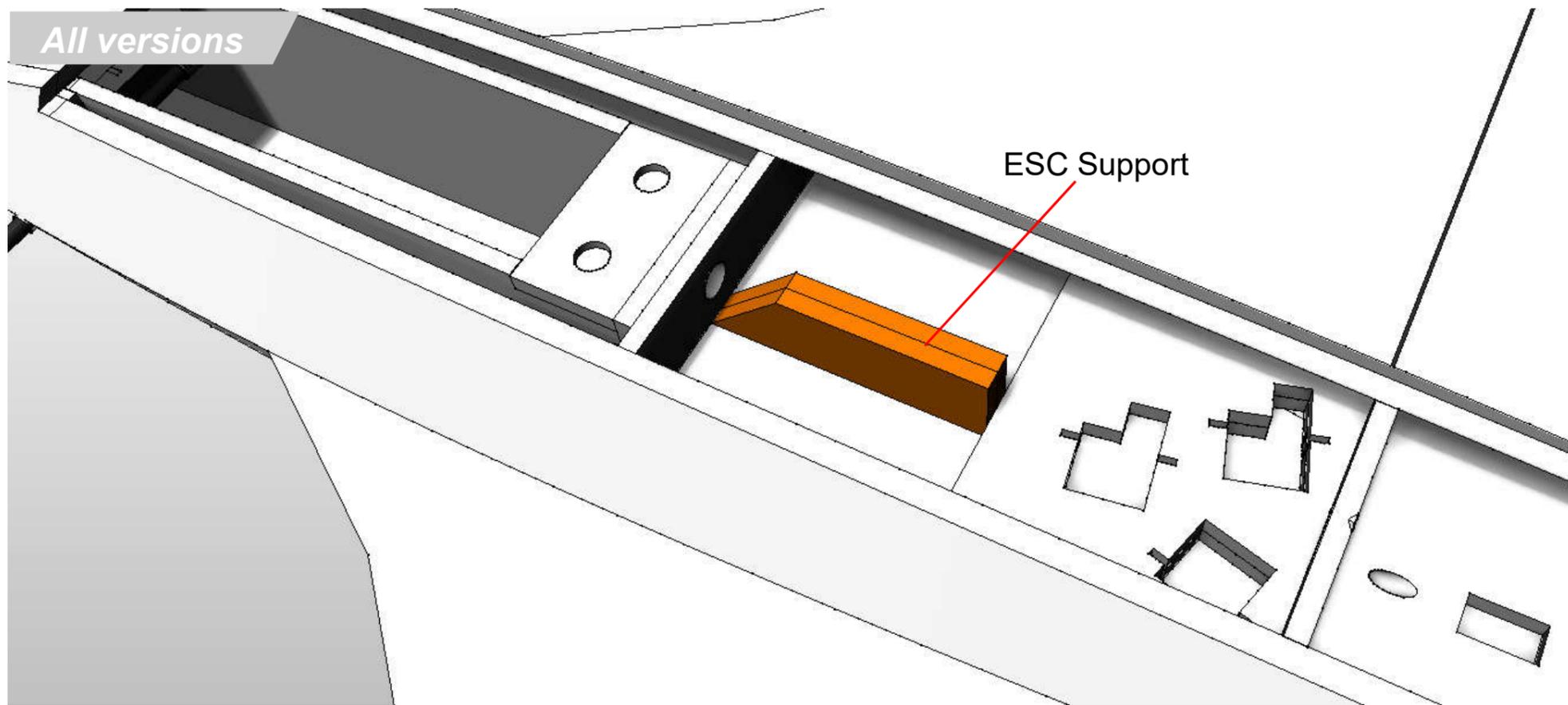
Nosecone

3D Printed Part
(optional)

Glue the **Nosecone** onto the fuselage using Epoxy/Microballoons mix



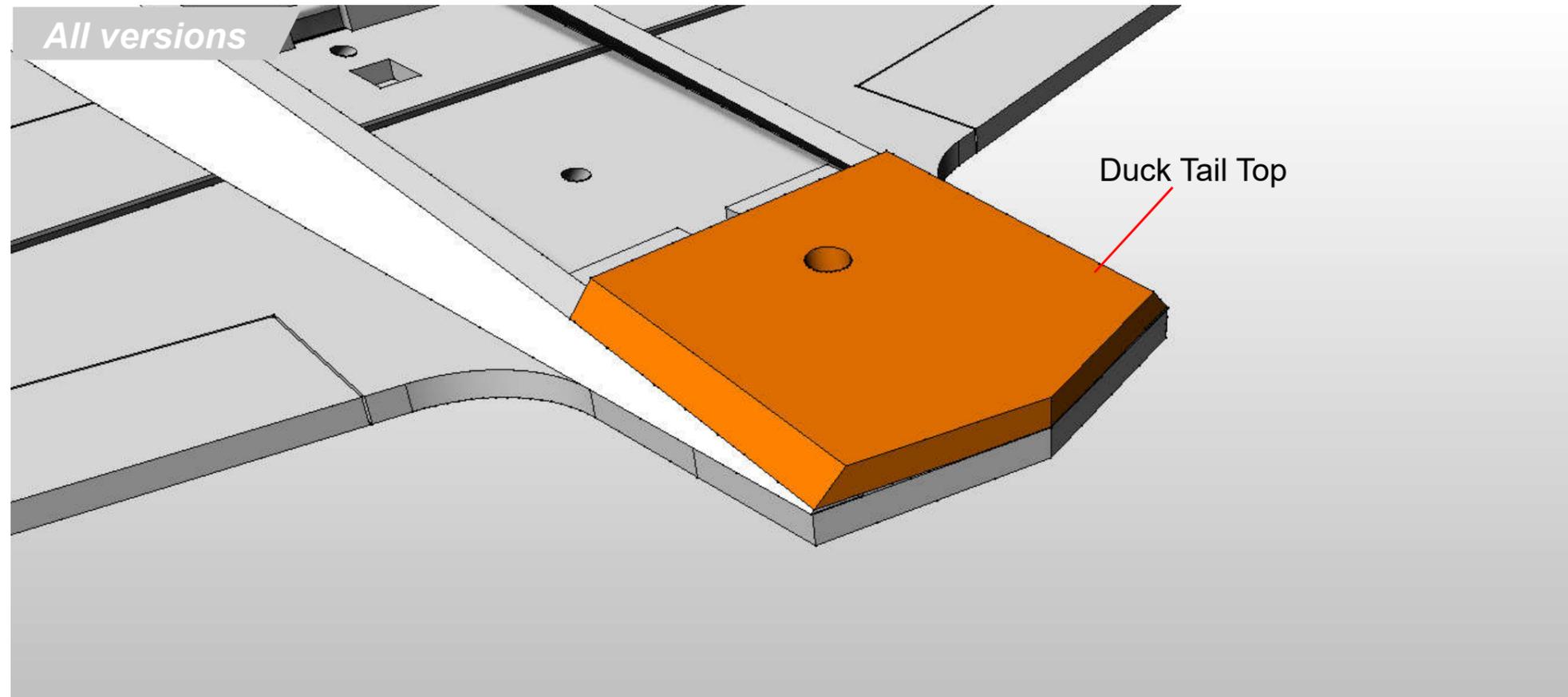
All versions



Glue the two pieces of the **ESC support** together and then onto the centreline of the servo bay.

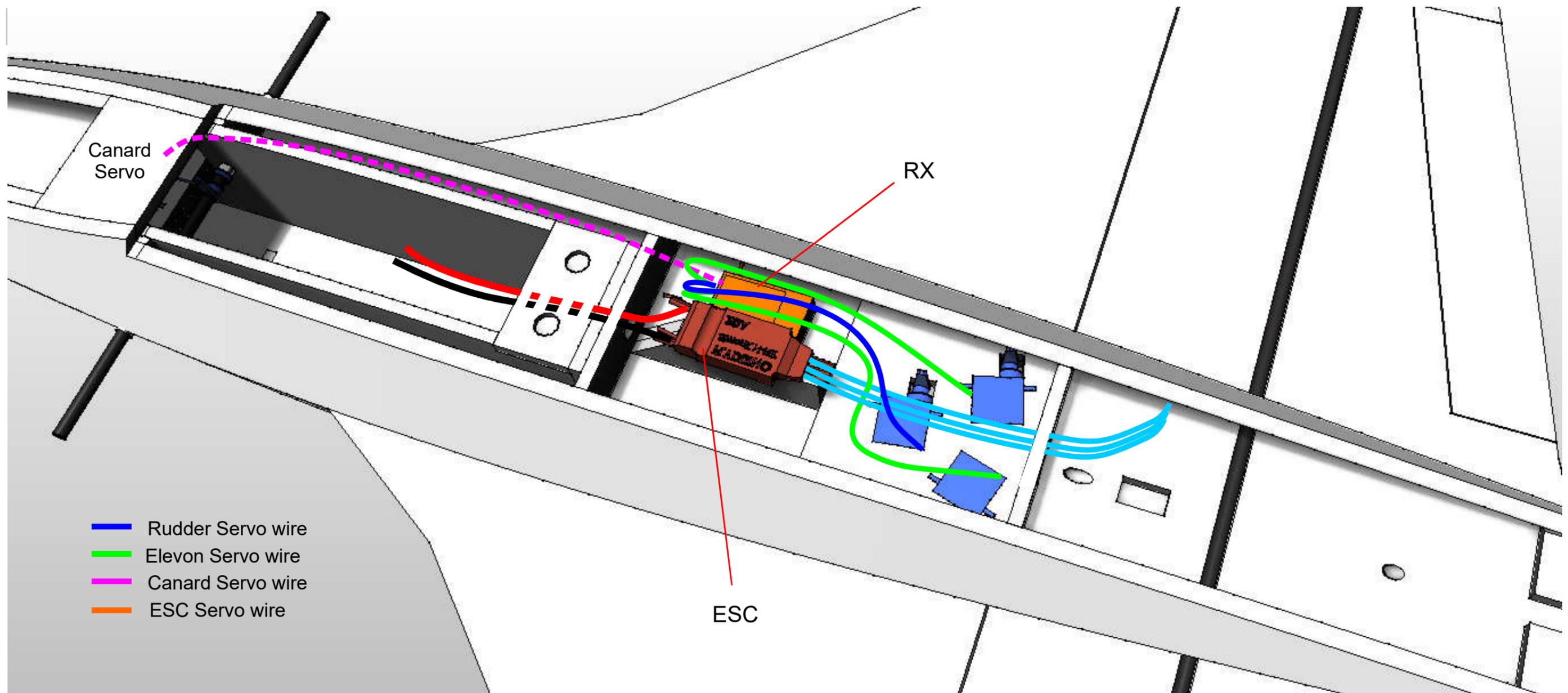


All versions



Glue the **Duck Tail Top** onto the fuselage using Epoxy/Microballoons





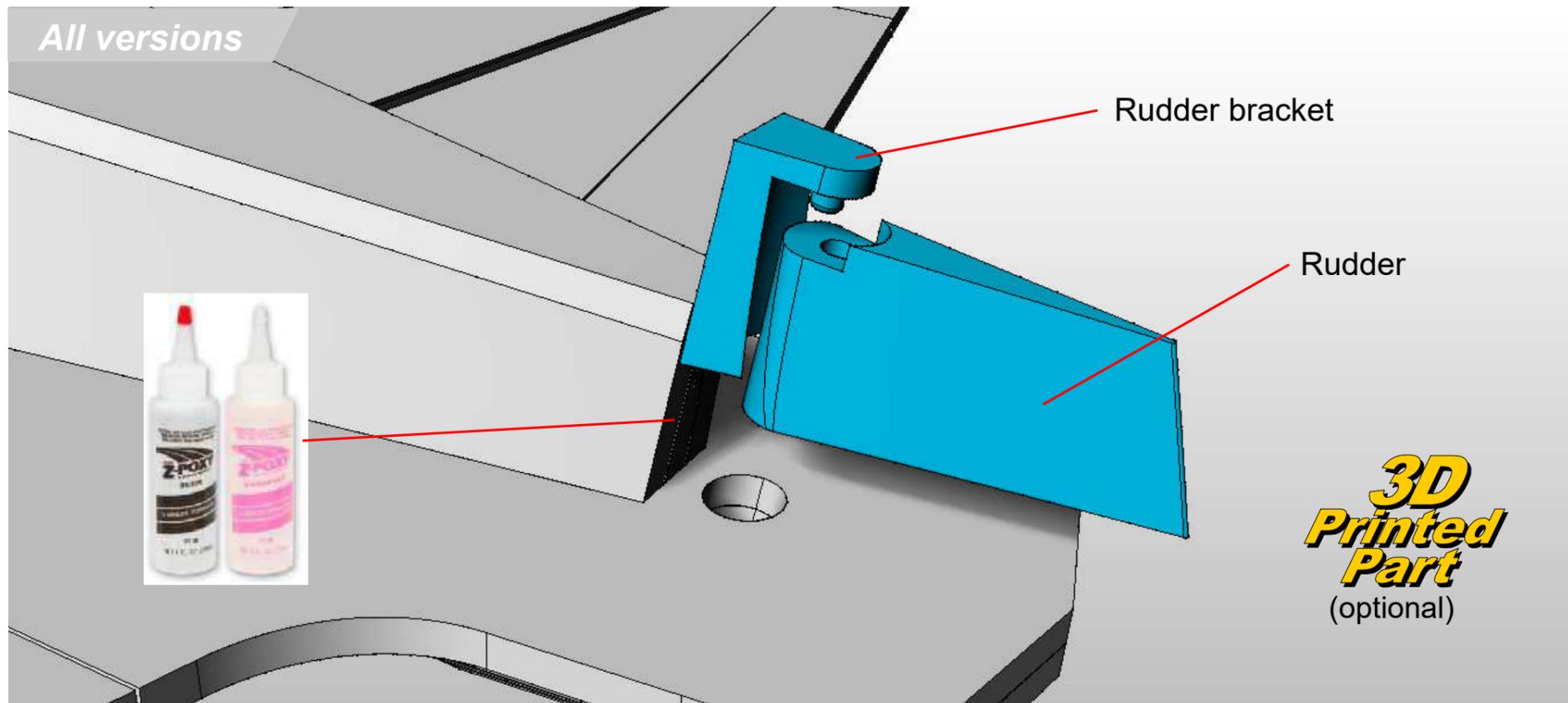
Run the Canard servo around the battery box, using an extension cable. Rest the ESC onto the top of the ESC support - to be fixed later. Connect everything together.

If you are creating the pusher version then use a servo extension cable and run cable through the hole in Bulkhead 5 (along with the motor cables), leaving the servo itself loose until later in the build process.

Temporarily connect the motor to the wiring to test / set-up the servos. You may wish to disconnect it until the mounting of the motor stage later in the build.

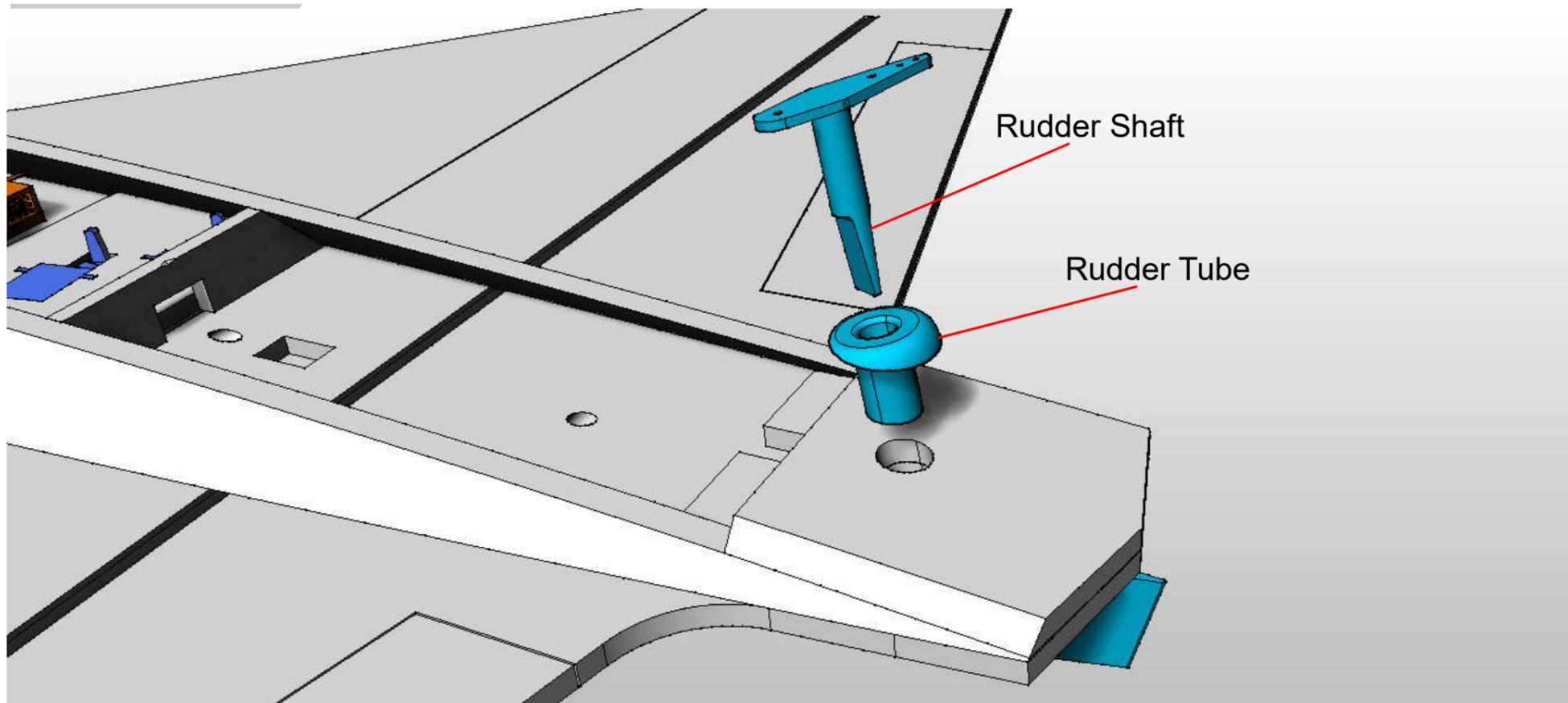


All versions



Dry Fit the complete the rudder assembly (4 pieces) before using any glue in case the depron needs trimming.

Once you have done this, slot the rudder into the rudder bracket. Protect with masking tape, then glue the Rudder bracket into place using epoxy (Scratch a rough bonding surface beforehand using a course grade sandpaper)

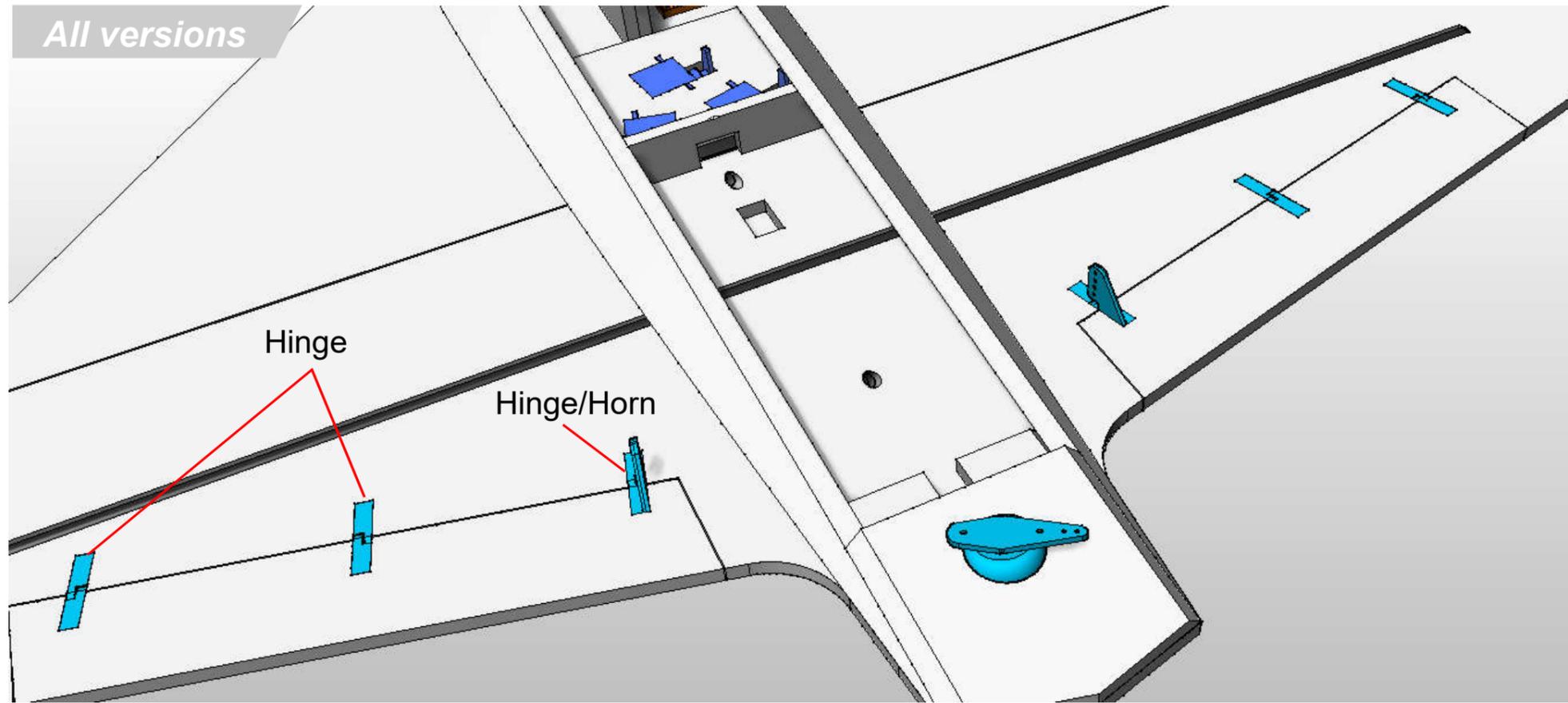


Glue the Rudder Tube to the Fuselage using a small amount of epoxy. Slide the tube in to the hole whilst holding the plane upside down to prevent any epoxy from dribbling into the rudder below.

Once the glue has set, Push the Rudder Shaft into the rudder assembly. drill and put a small stainless self-tapping screw through the side of the rudder and into the shaft to secure it's position.



All versions

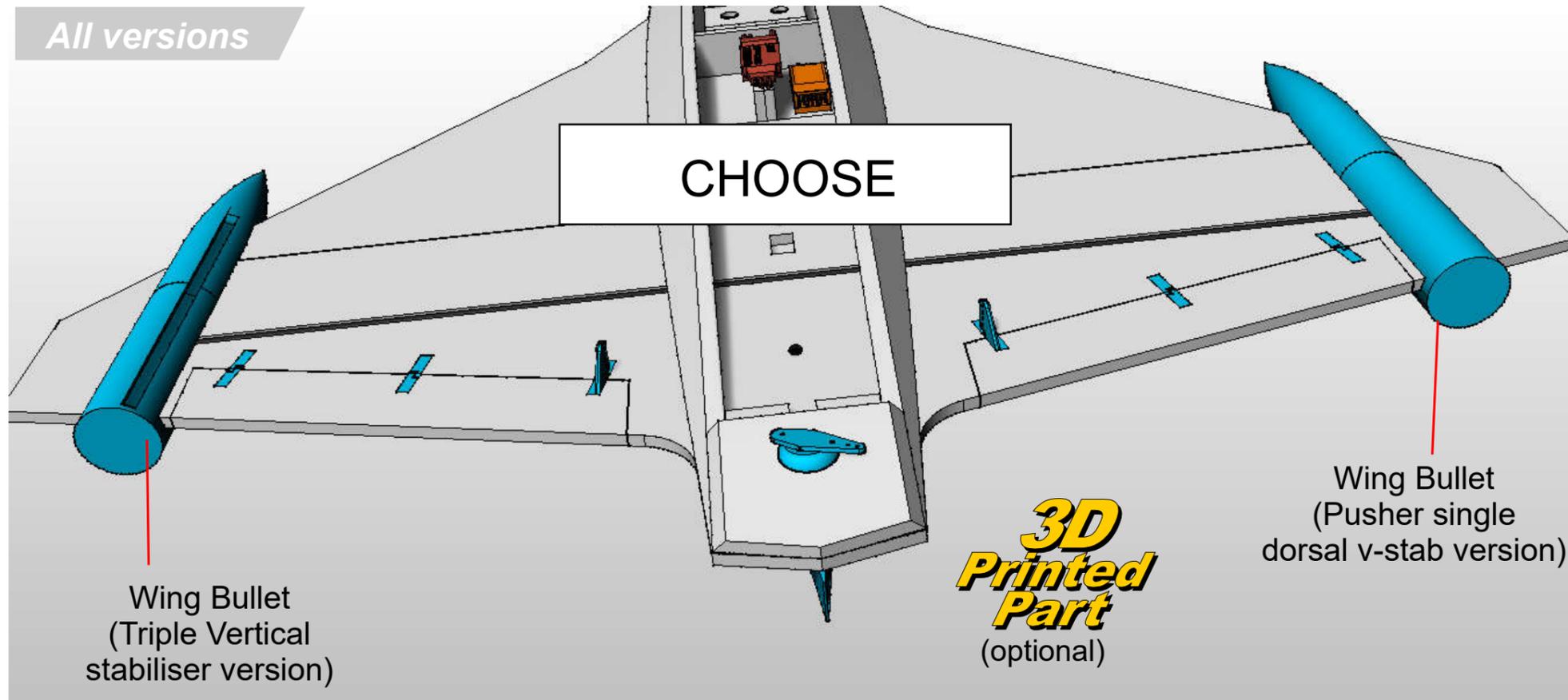


Glue the 3d Printed hinges with the control horns facing upwards.

I particularly like these hinges as the horn is part of the hinge, ensuring precise control.



All versions



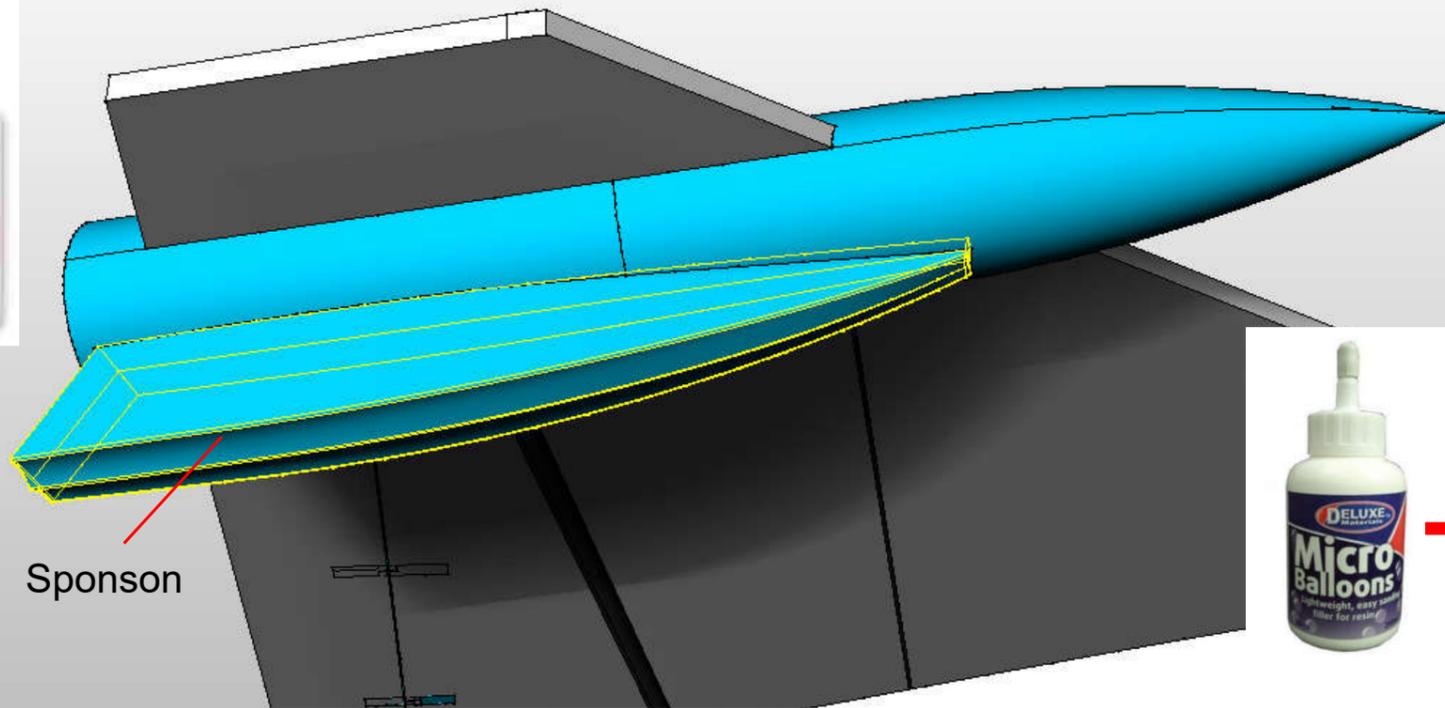
If you are making a Pusher version, you can either build a single large vertical stabiliser, or three smaller vertical stabilisers.

Choose the wing bullet that matches your choice.

Glue in place using a little epoxy in alignment with the markings on the plans.



All versions



**3D
Printed
Part**
(optional)

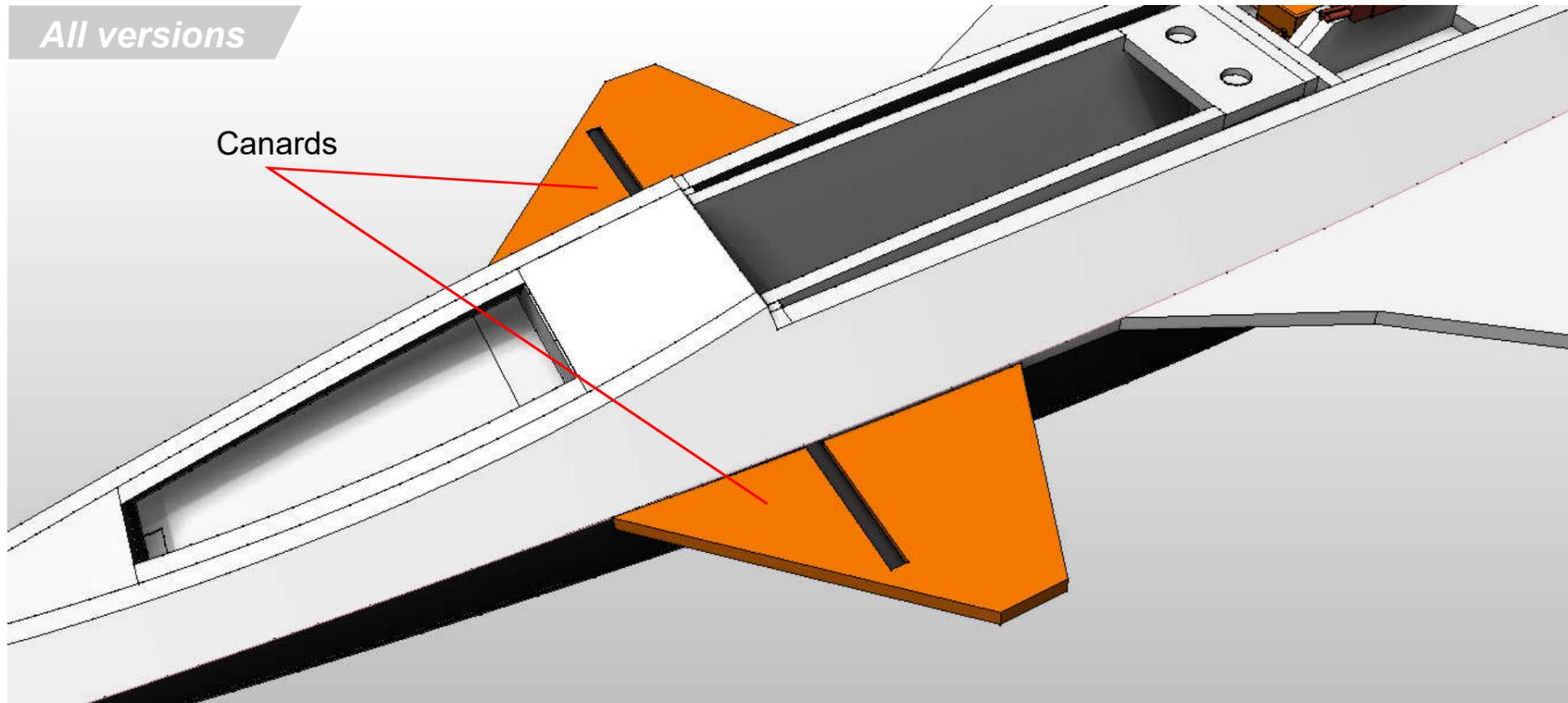


Glue the **Sponsons** to the Wing bullets using Epoxy/Micro-balloons.

Tape in place until cured.

Using scrap depron, apply a thin coat of epoxy to the sponsons to increase their durability and waterproofing. Typically 3d prints are not very waterproof.

All versions



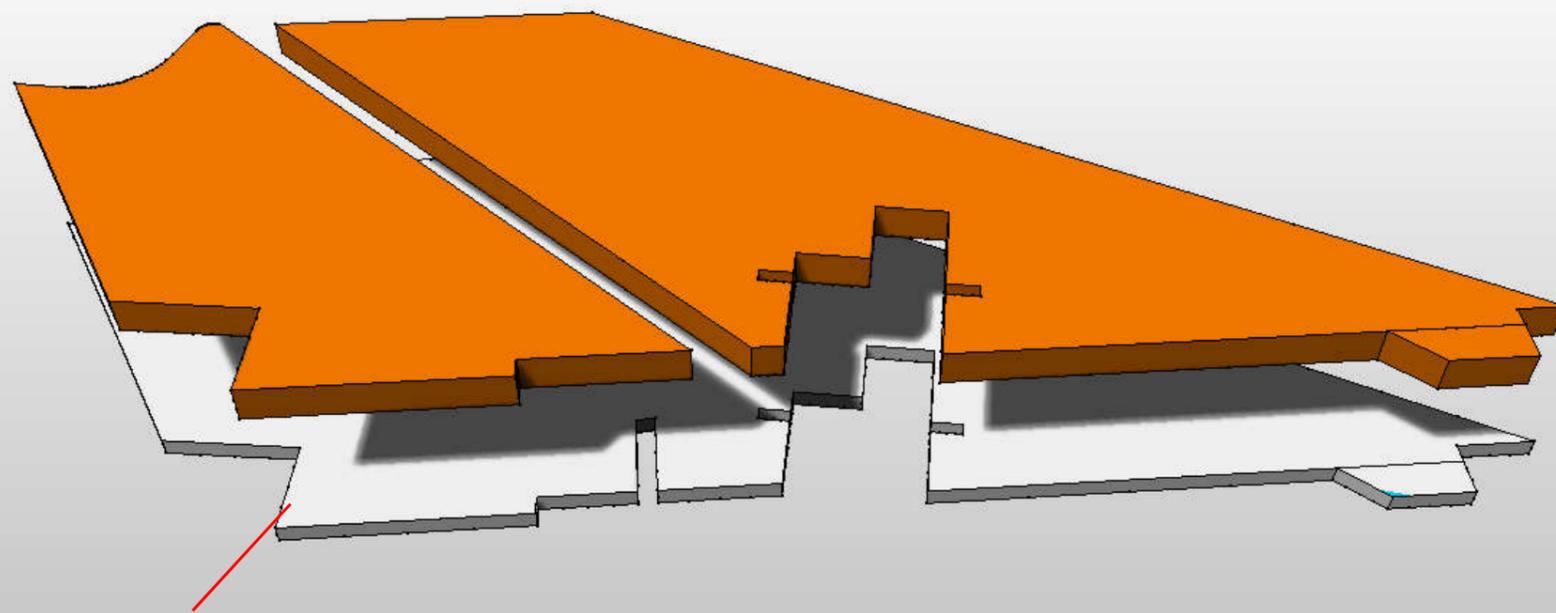
Glue the Canards onto the carbon spar and set perfectly horizontal.

Be careful not get any epoxy into the tube.

Use Masking tape top and bottom of the slot to keep the epoxy in place while it cures.



Pusher only

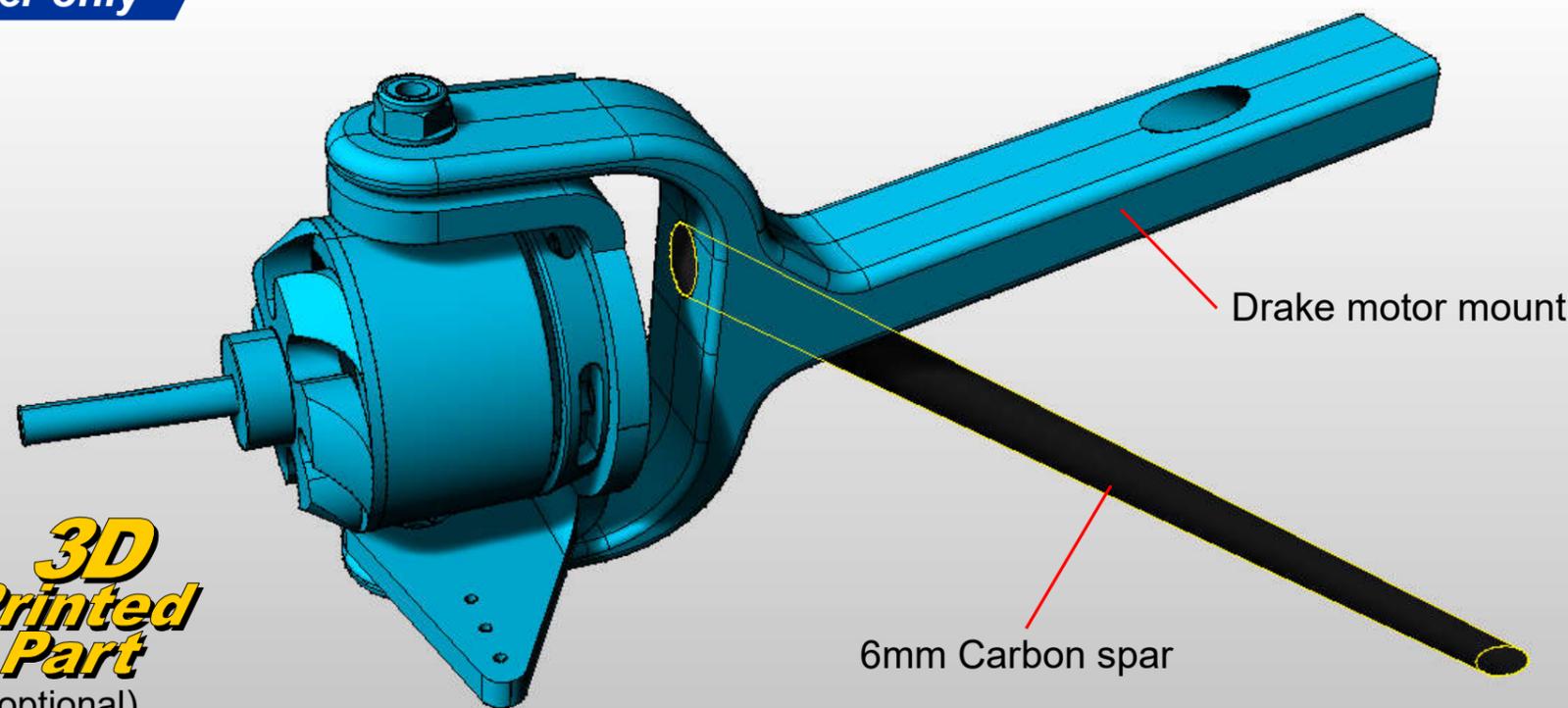


3mm Pusher Fin Outer (Small)

Glue one of the **3mm Fin Outer** to the **6mm Inner Piece**.



Pusher only



**3D
Printed
Part**
(optional)

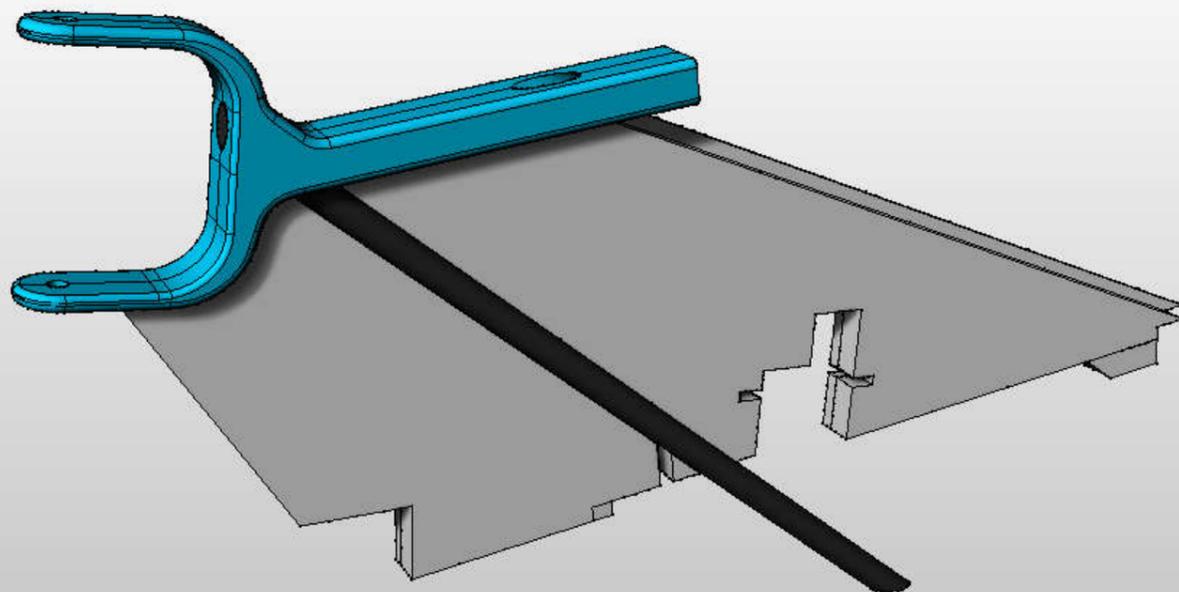
Drake motor mount

6mm Carbon spar

Glue the 6mm Carbon spar into the Motor mount as shown using epoxy,



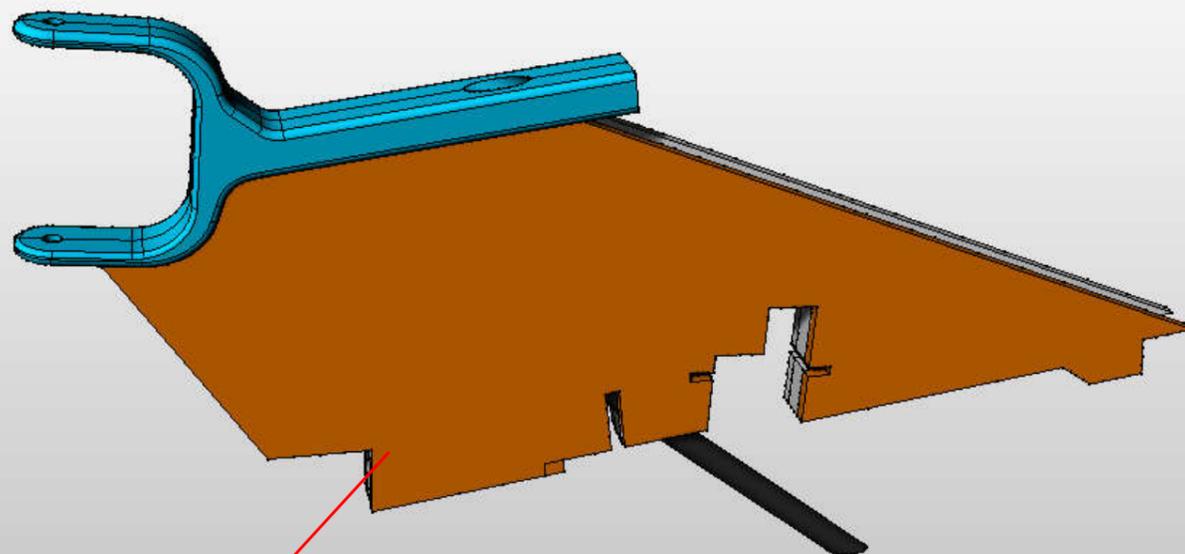
Pusher only



Glue the Depron fin to the motor mount using epoxy along the edge of the mount, and all along the carbon. Use masking tape in the same way as the wing to contain the epoxy while it cures.



Pusher only

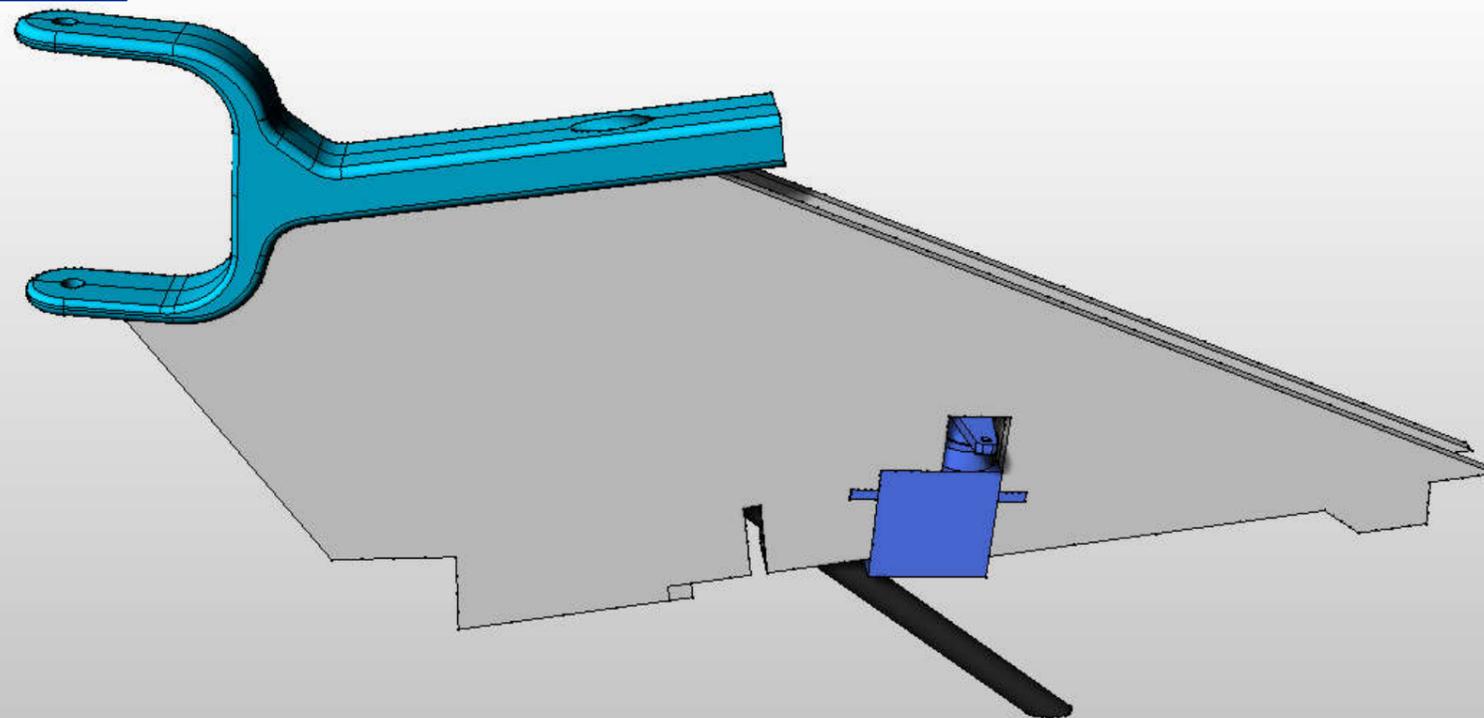


3mm Pusher Fin Outer (Small)

Glue the outer 3mm foam sheet onto the assembly.



Pusher only

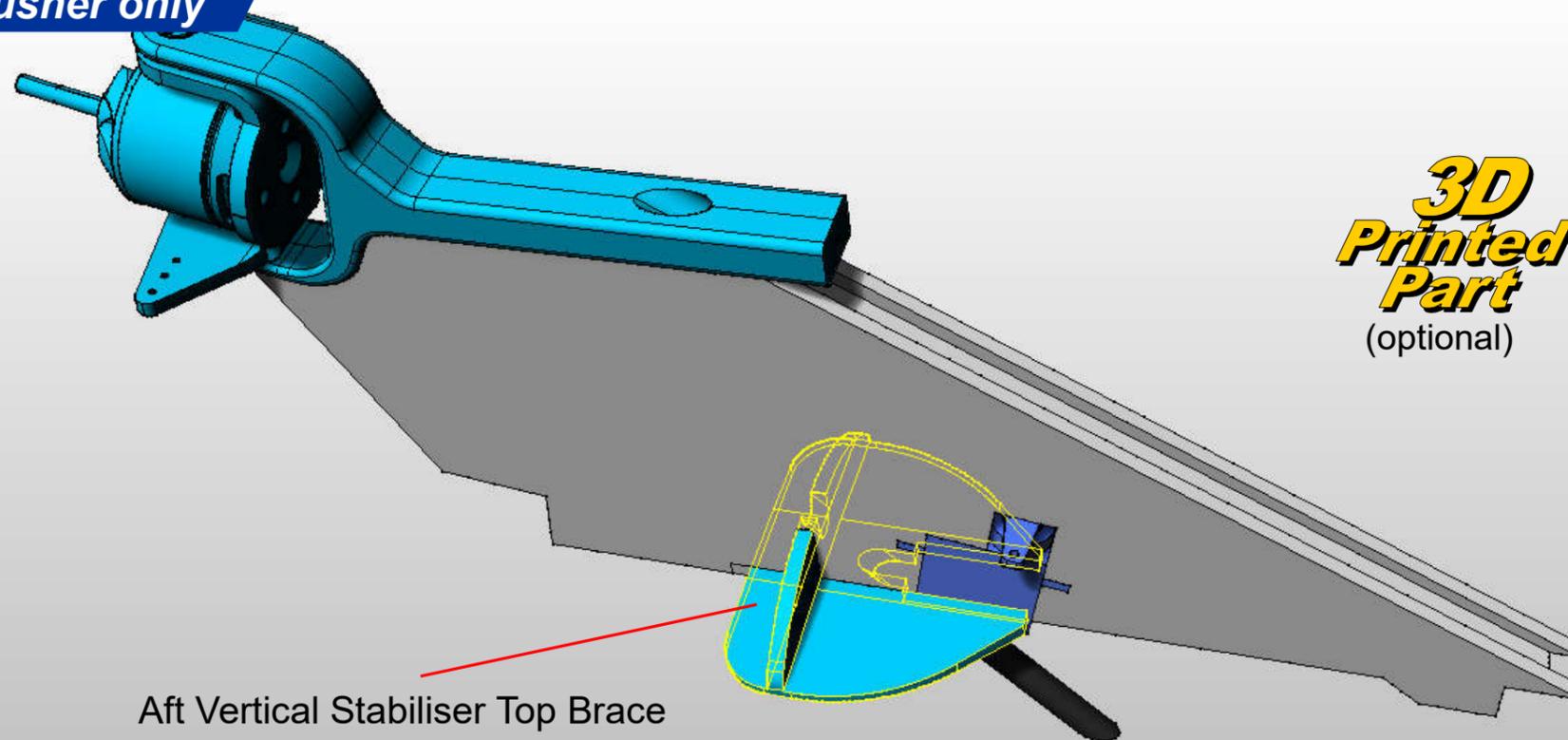


Glue the Rudder Servo into the rudder slot using hot melt glue.

I recommend using a metal gear servo of reputable quality. 12g+



Pusher only



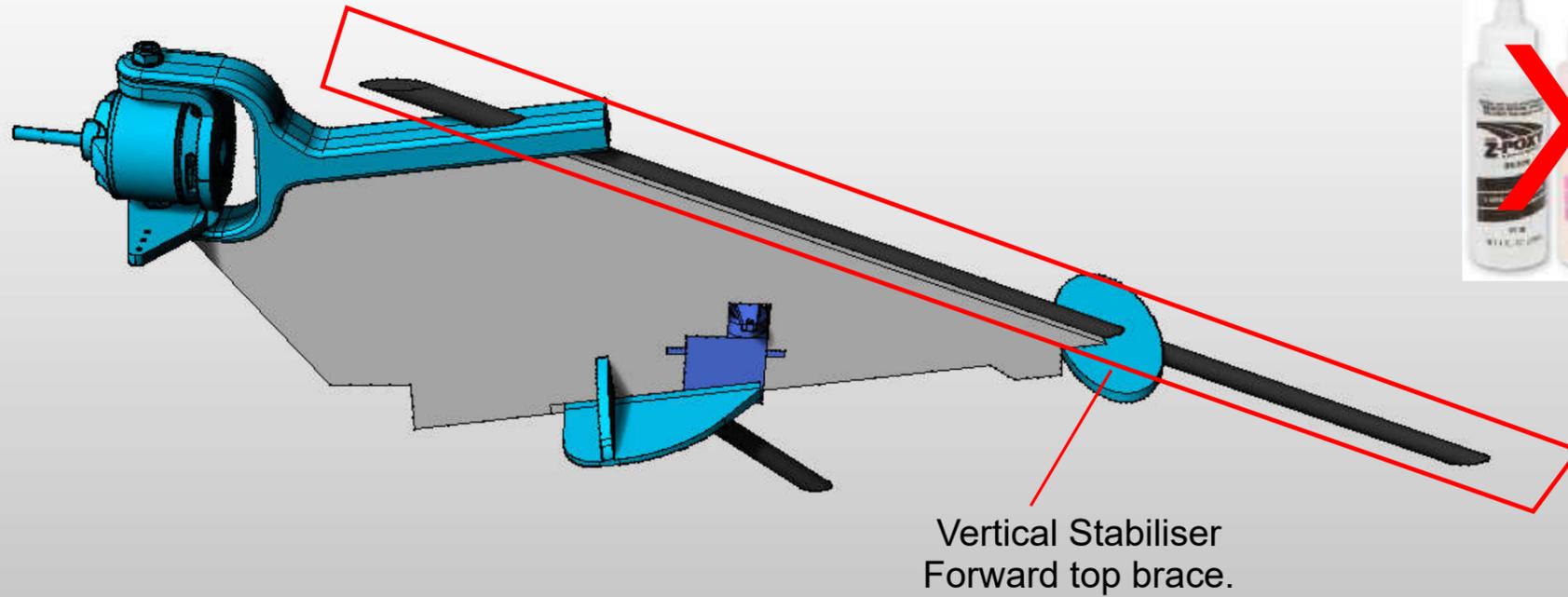
Aft Vertical Stabiliser Top Brace

**3D
Printed
Part**
(optional)

Glue the outer 3mm foam sheet onto the assembly.

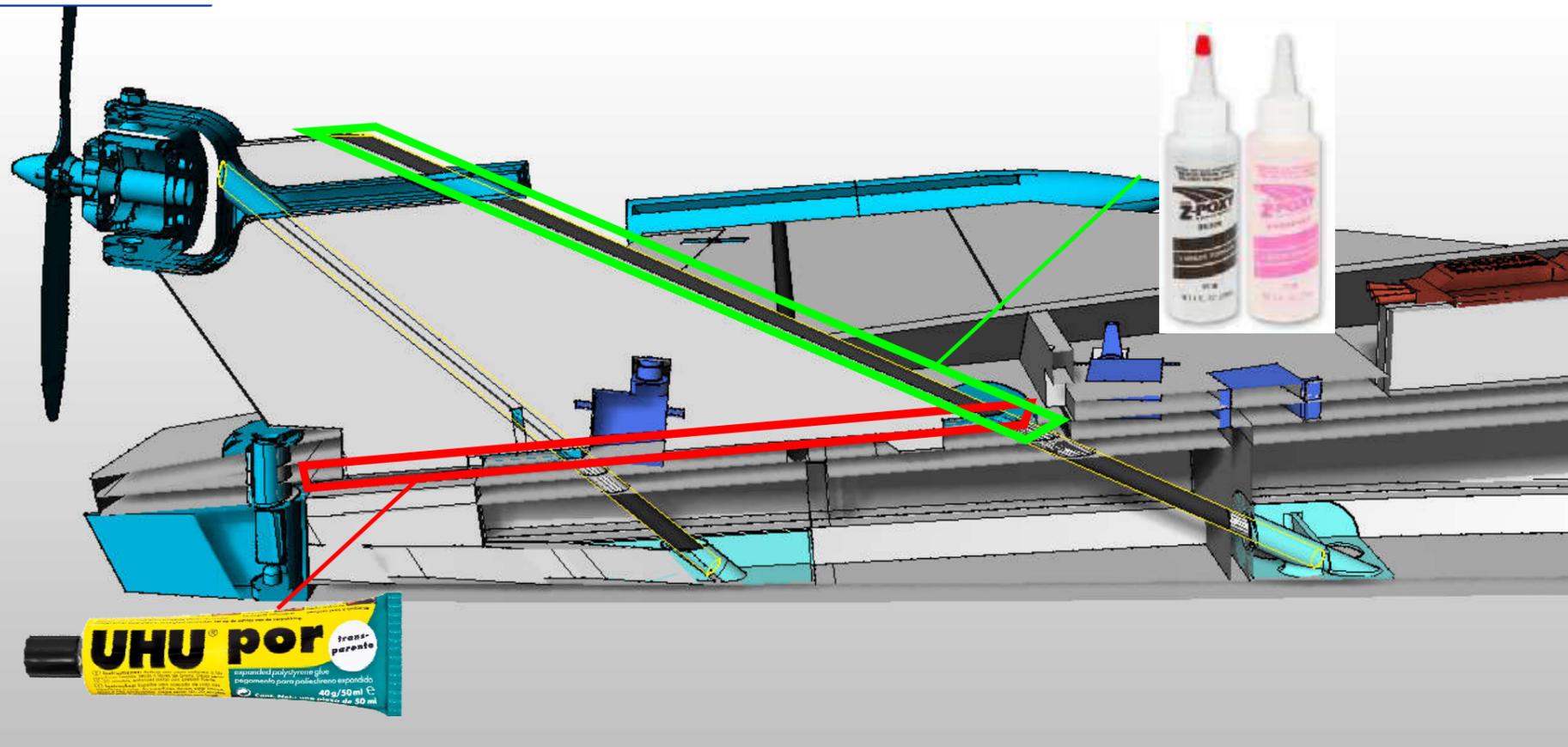


Pusher only



Test fit the forward carbon spar so that it is possible to slide down through the motor mount, along the gully and through the forward top brace.

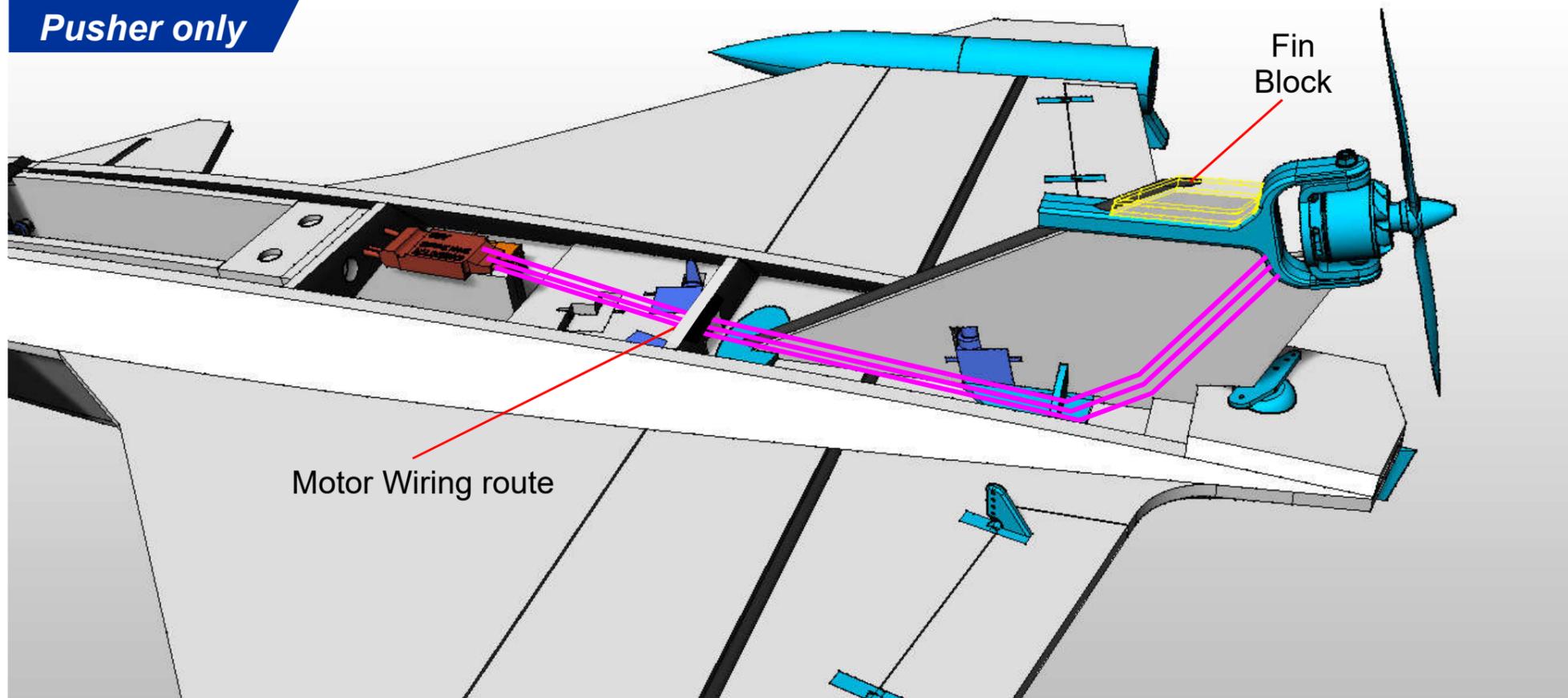
If it is too tight - drill out using a 6.5mm drill bit until it passes through.



Dry fit the fin assembly to the fuselage. In order to fit it, remove the forward spar. Slide it down on the rear spar until it locates into the hull brace. Once it is all sitting down properly. Slide the forward spar down from the top until it locks into the forward hull brace. Once you can fit it together well, disassemble and glue to the fuselage. Use UHU along the bottom of the fin and braces. Use Epoxy on the forward carbon spar. You do not need to glue the ends of the carbon into the braces.



Pusher only

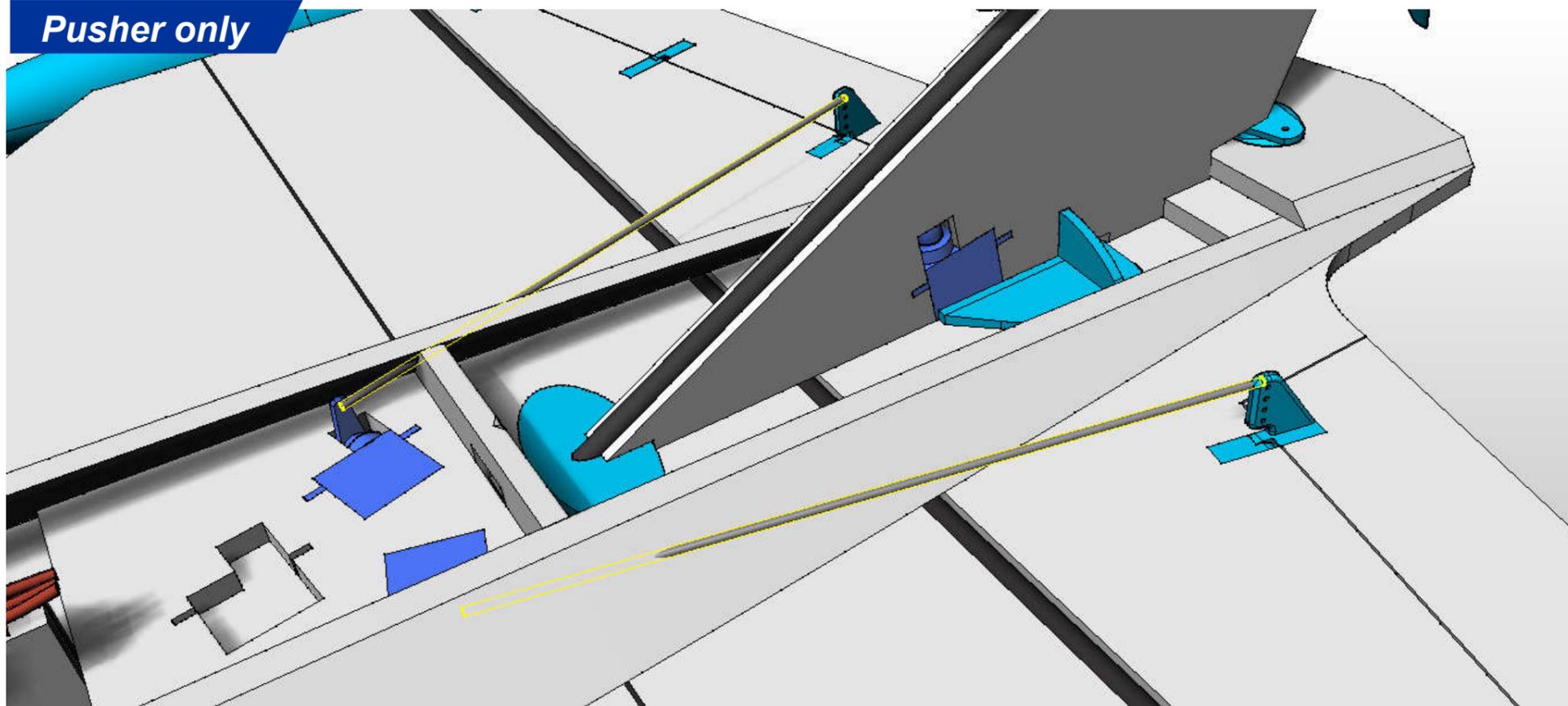


Glue the remains of the fin 'block' at the top of the fin using UHU por.

Connect the motor cables and check the correct turning direction.

Recess the cables into the 3mm foam.

Pusher only

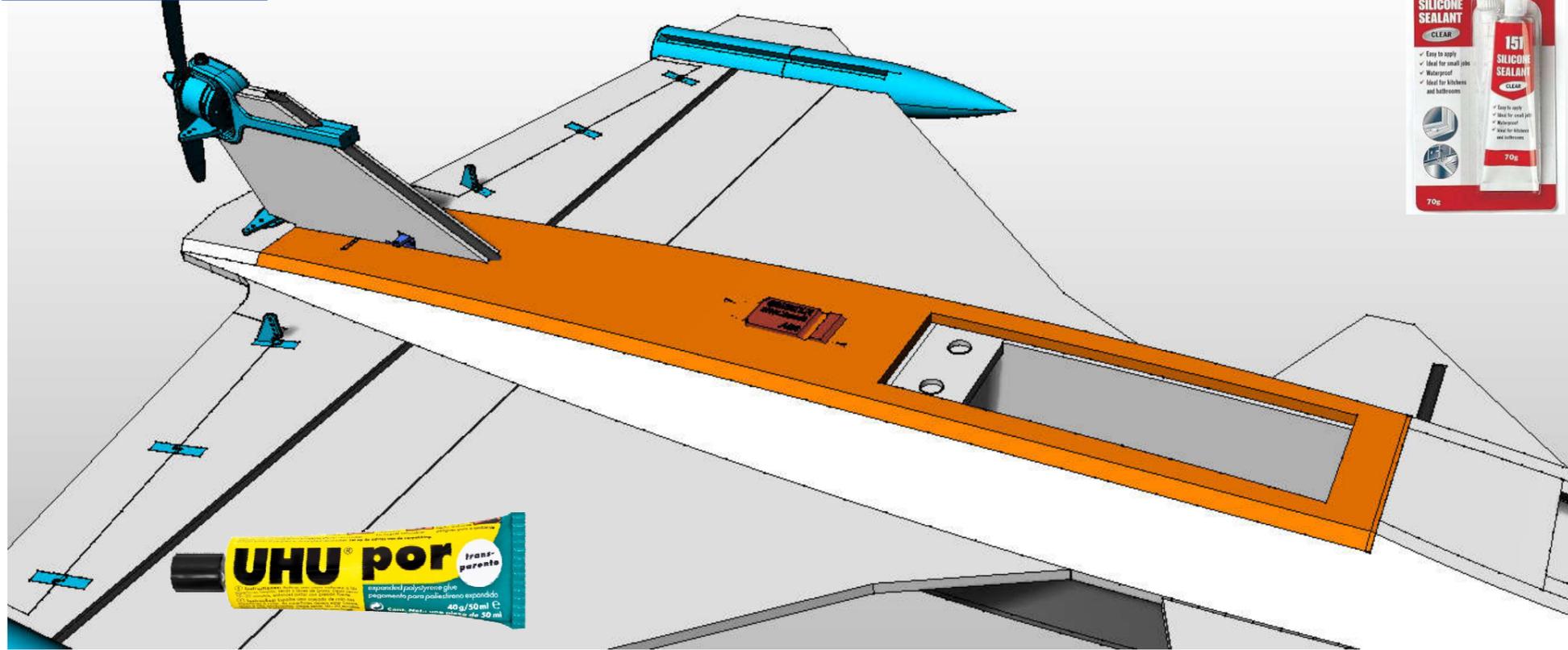


Perforate the Depron with the Elevon Pushrods and connect both to servos and control horns.

If using steel pushrods, ensure they are painted and protected from corrosion before fitment.



Pusher only

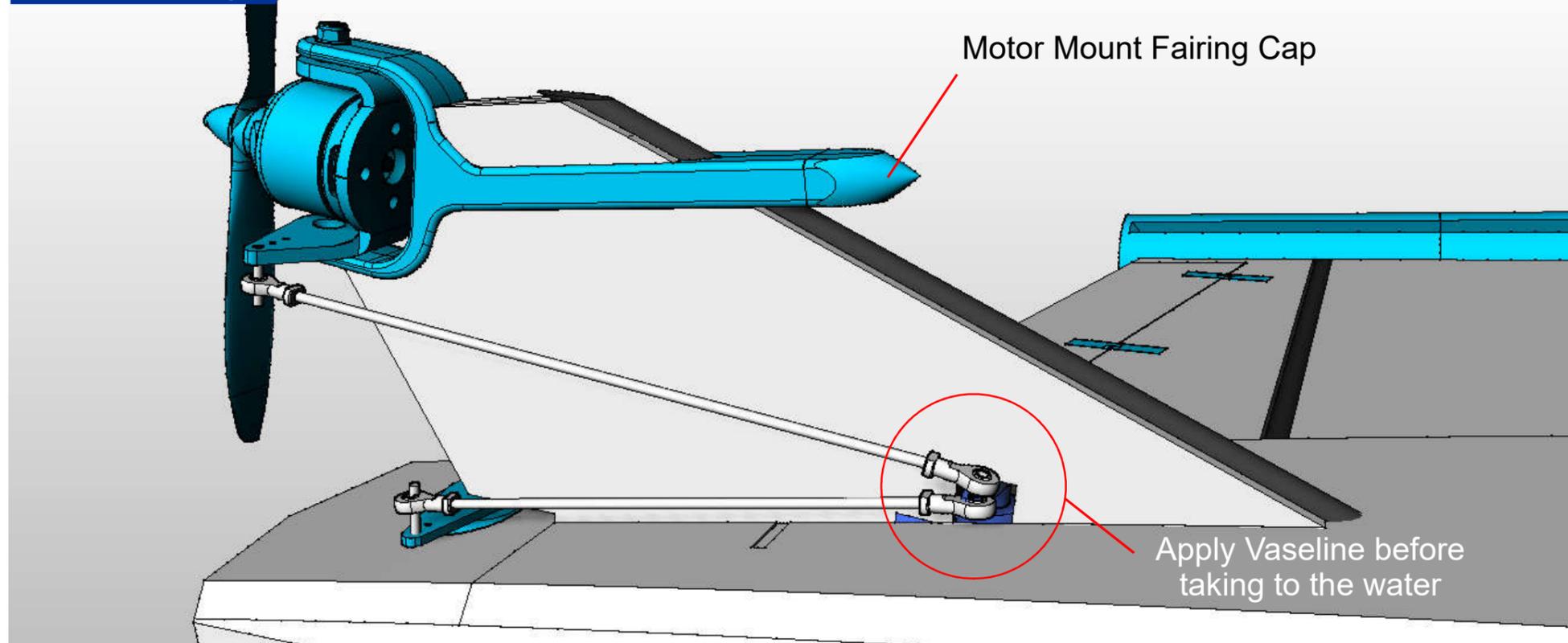


Dry Fit the **Fuselage top** to the assembly ensuring a good fit throughout. Allow a 3mm shoulder in the battery bay for the access hatch to sit in.

Carefully trim away the area around and under your ESC until the cooling heat-sink is flush to the top surface and hardly has any gaps around it.

Glue the fuselage top down using UHU por. Set the ESC in using silicone sealant, to provide a watertight surrounding for the ESC.

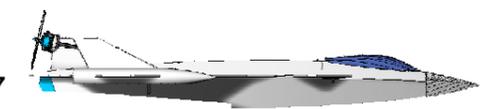
Pusher only



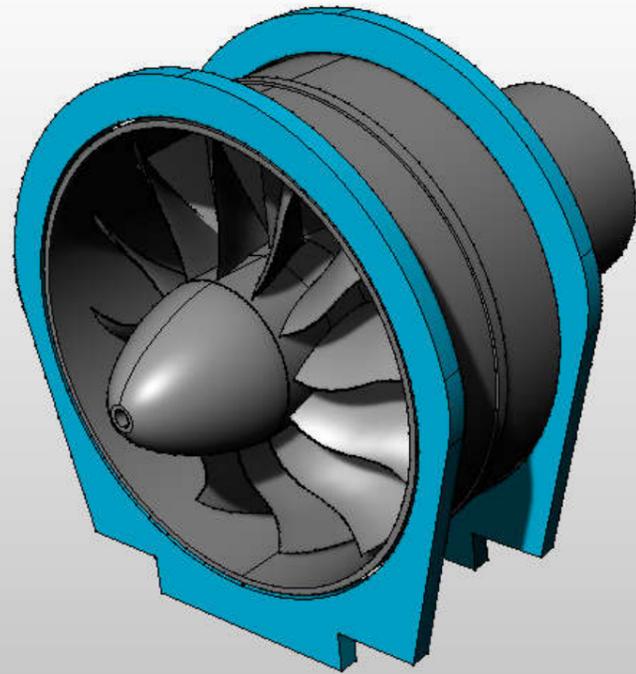
Using brass or stainless M2 screws connect the plastic/brass Ball joints together using 2mm painted pushrods screwed into the plastic clevises. The Rudder and Thrust vectoring system should now be operational.

If you are not fitting the single big fin, then glue the **Motor Mount Fairing cap** to the end of the motor mount using uhu por.

When you take the Drake onto the water, pack the servo aperture with Vaseline to Waterproof it.

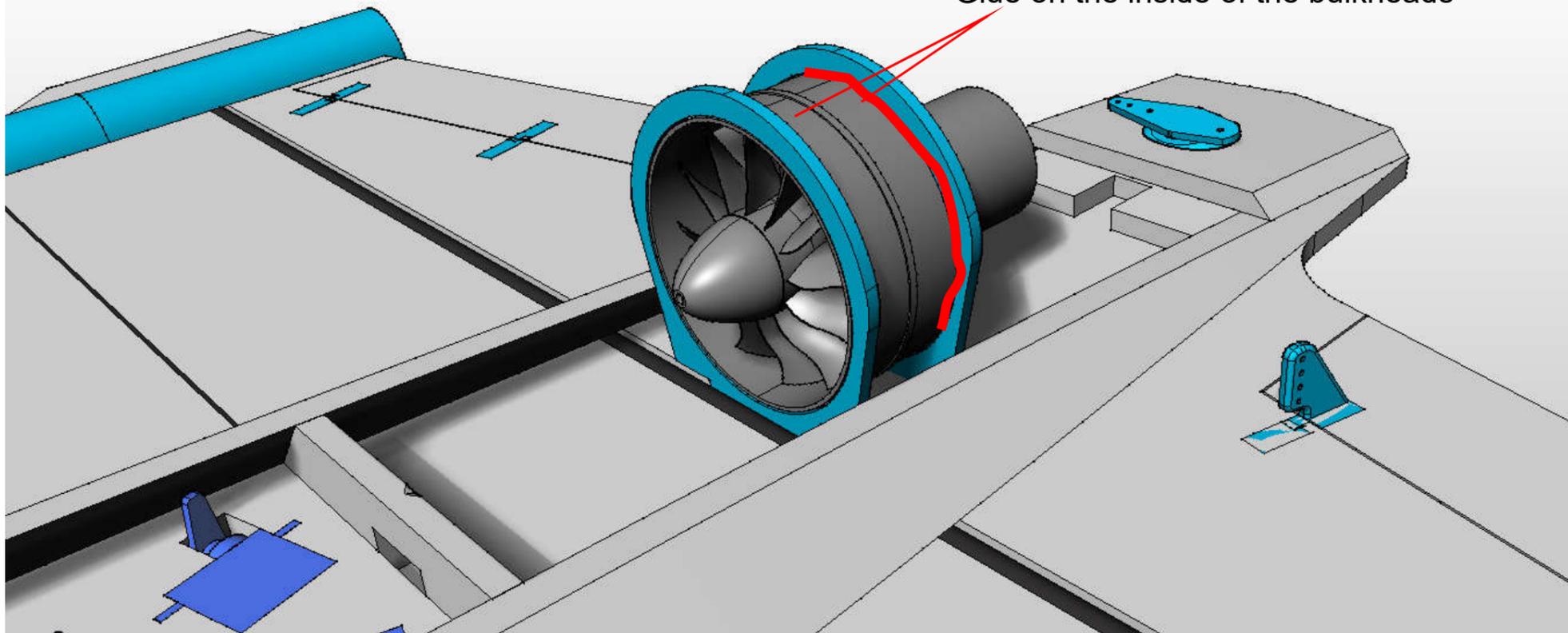


EDF only



Dry Fit the EDF Bulkheads to your chosen EDF to check fit.

EDF only

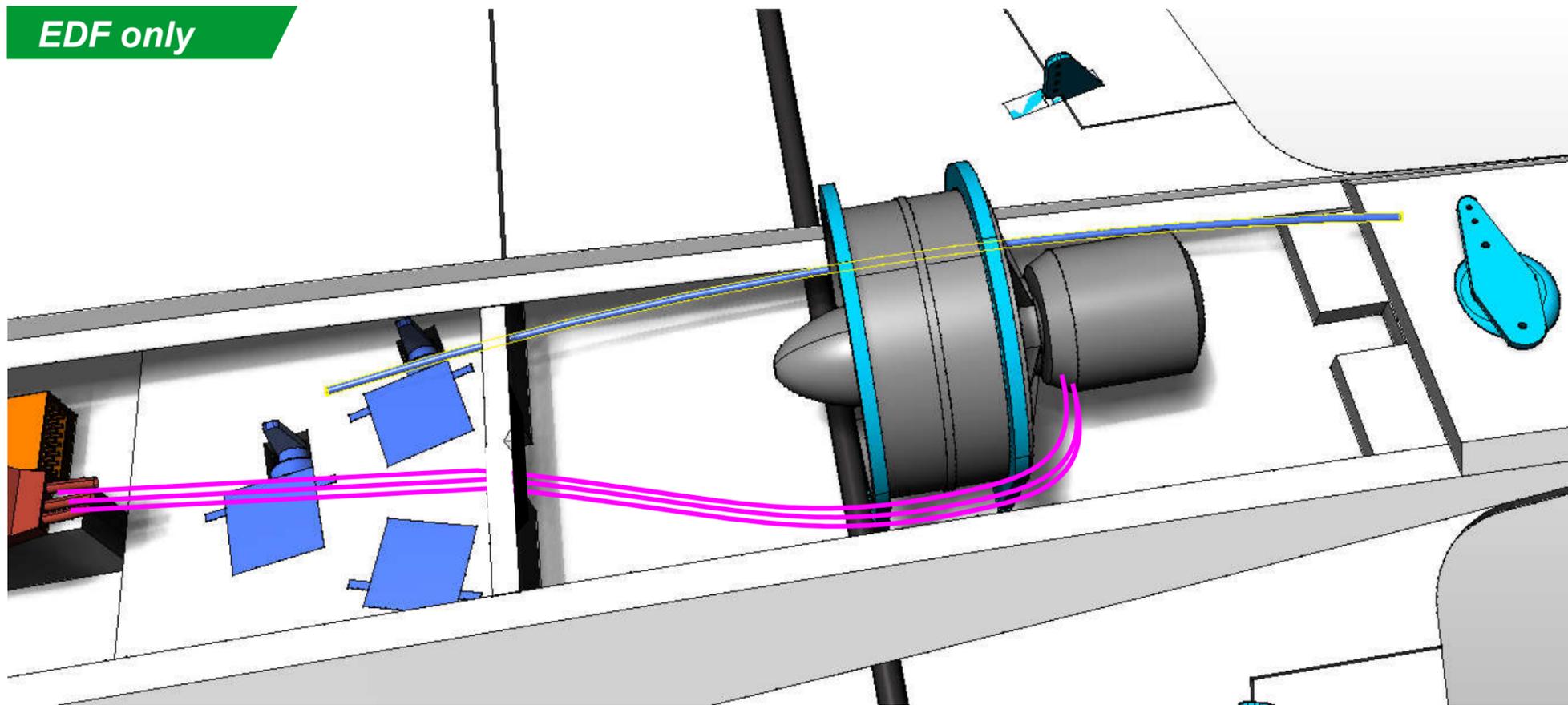


Glue on the inside of the bulkheads

Glue the EDF Bulkheads into the slots on the wing with the EDF correctly aligned then run a bead of hot melt plastic glue around the inside corner between the EDF and bulkheads to secure the EDF unit.



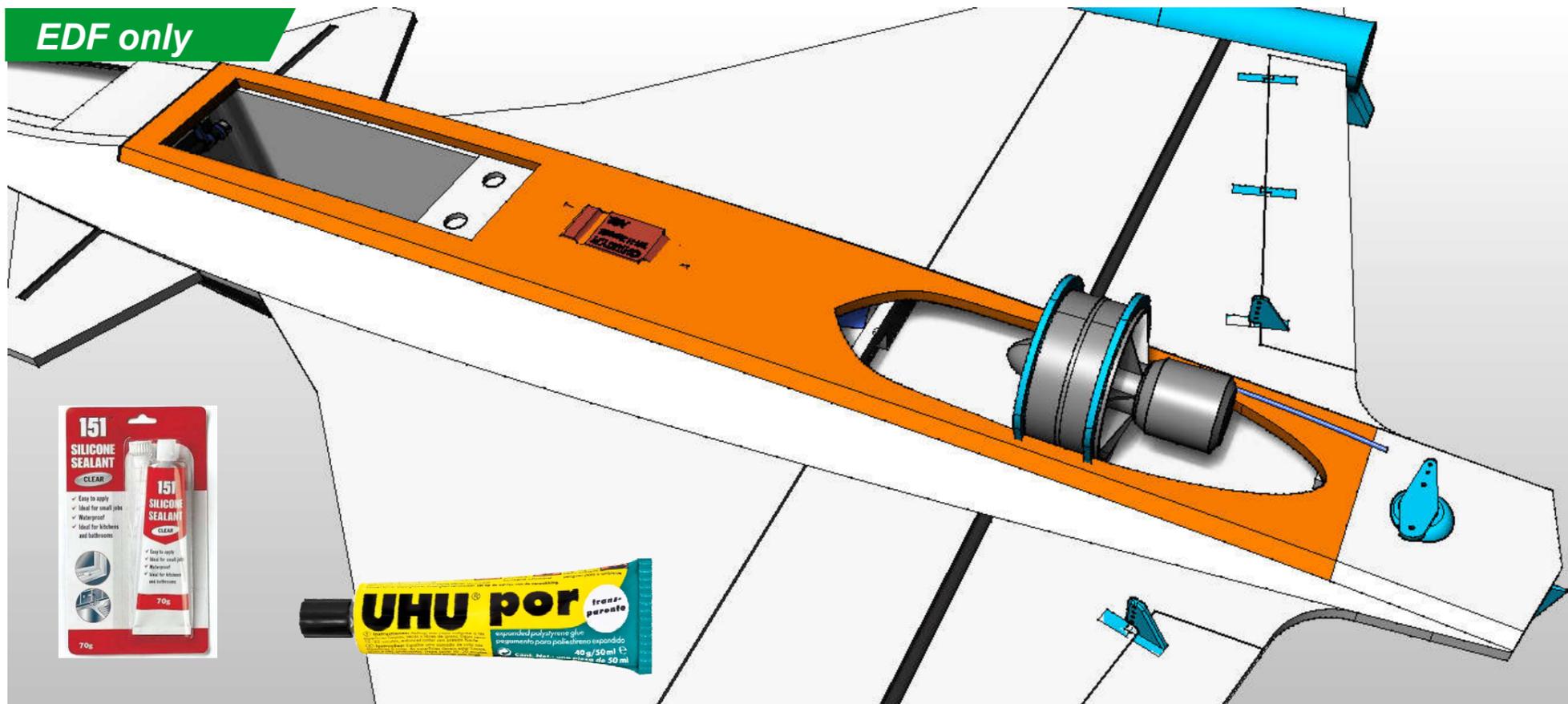
EDF only



Perforate bulkhead 5 and run a sheathed pushrod around the EDF unit, still within the airframe, from the Rudder servo and connect to the rudder..

On the other side, run the EDF motor wires to the edf unit.

EDF only



Dry fit the **Fuselage top** to the assembly ensuring a good fit throughout. Allow a 3mm shoulder in the battery bay for the access hatch to sit in. Carefully trim away the area around and under your ESC until the cooling heat-sink is flush to the top surface and hardly has any gaps around it. Trim away the foam around your bulkheads.

Glue the fuselage top down using UHU por. Set the ESC in using clear silicone sealant, to provide a watertight surrounding for the ESC.

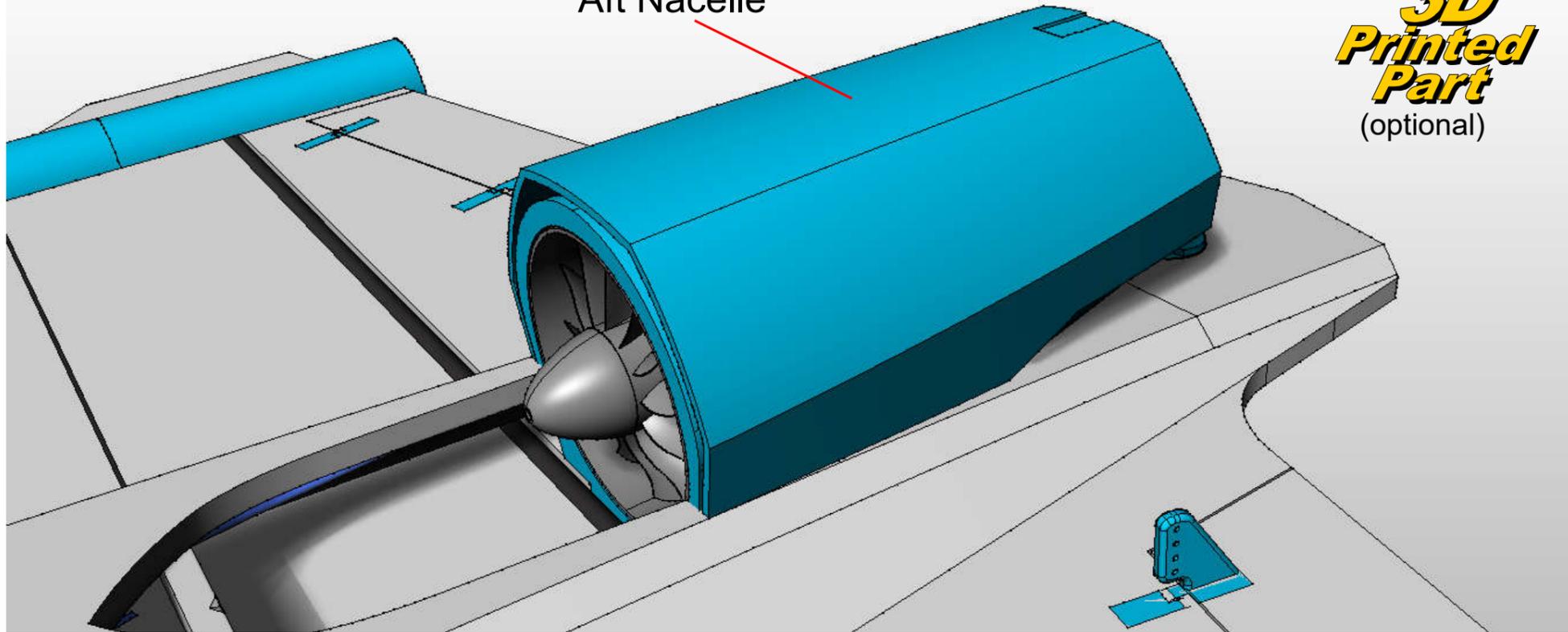
DRAKE III



EDF only

Aft Nacelle

**3D
Printed
Part**
(optional)



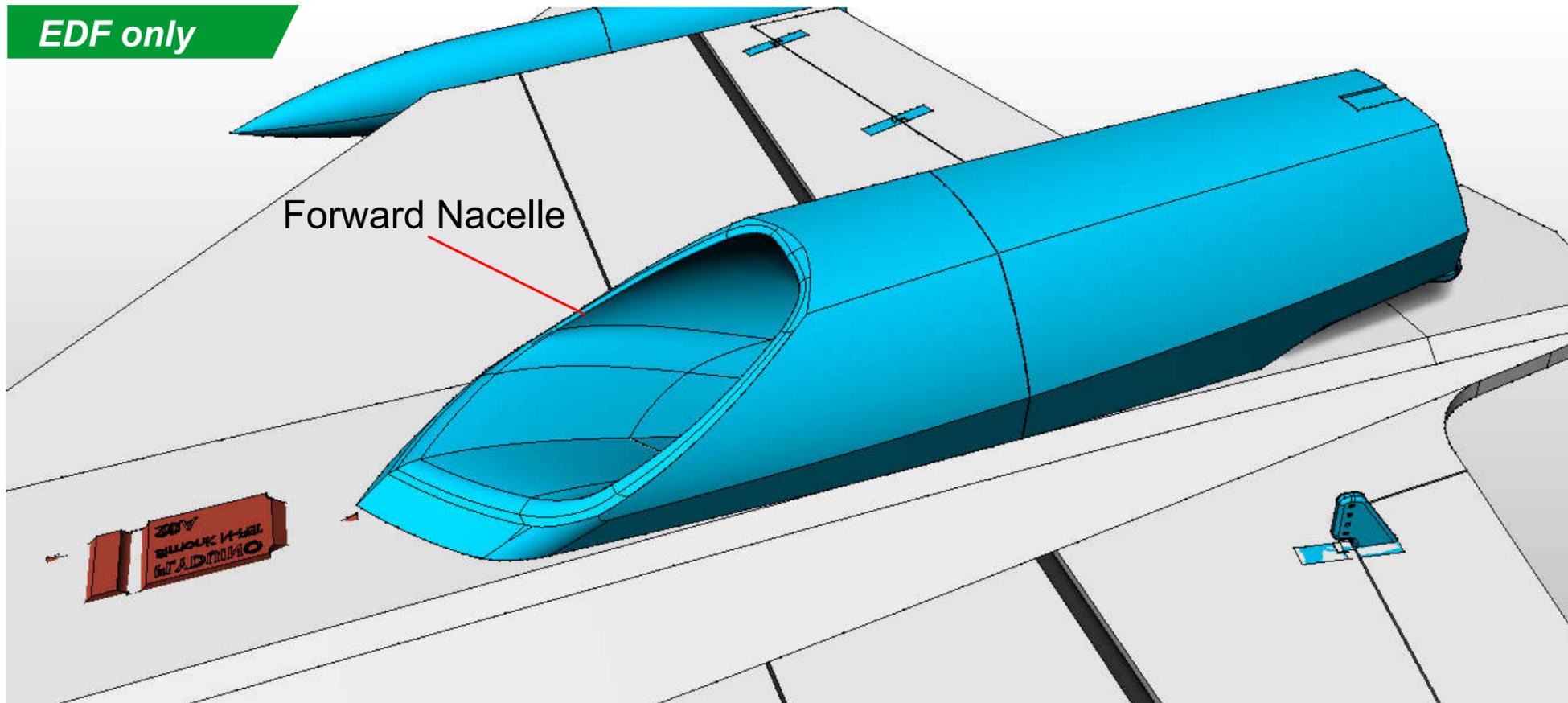
Using a soldering iron, melt a slot in the Aft Nacelle to suit your EDF motor cables.

Carefully slide on the Aft nacelle and glue into place using clear silicone.



EDF only

Forward Nacelle



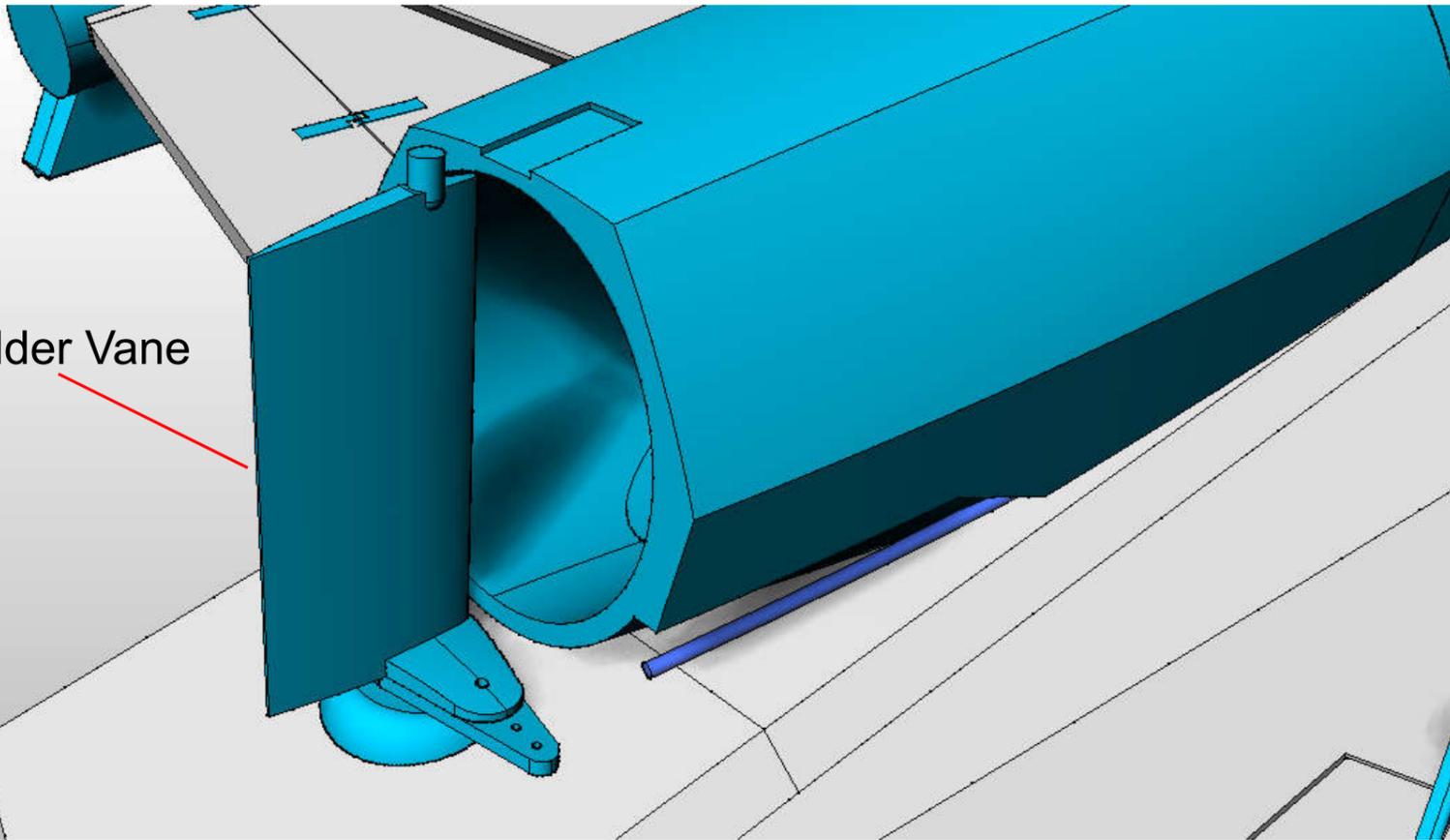
Carefully align the **Forward Nacelle** in place and glue in place using Clear Silicone Sealant.



EDF only

Rudder Vane

**3D
Printed
Part**
(optional)

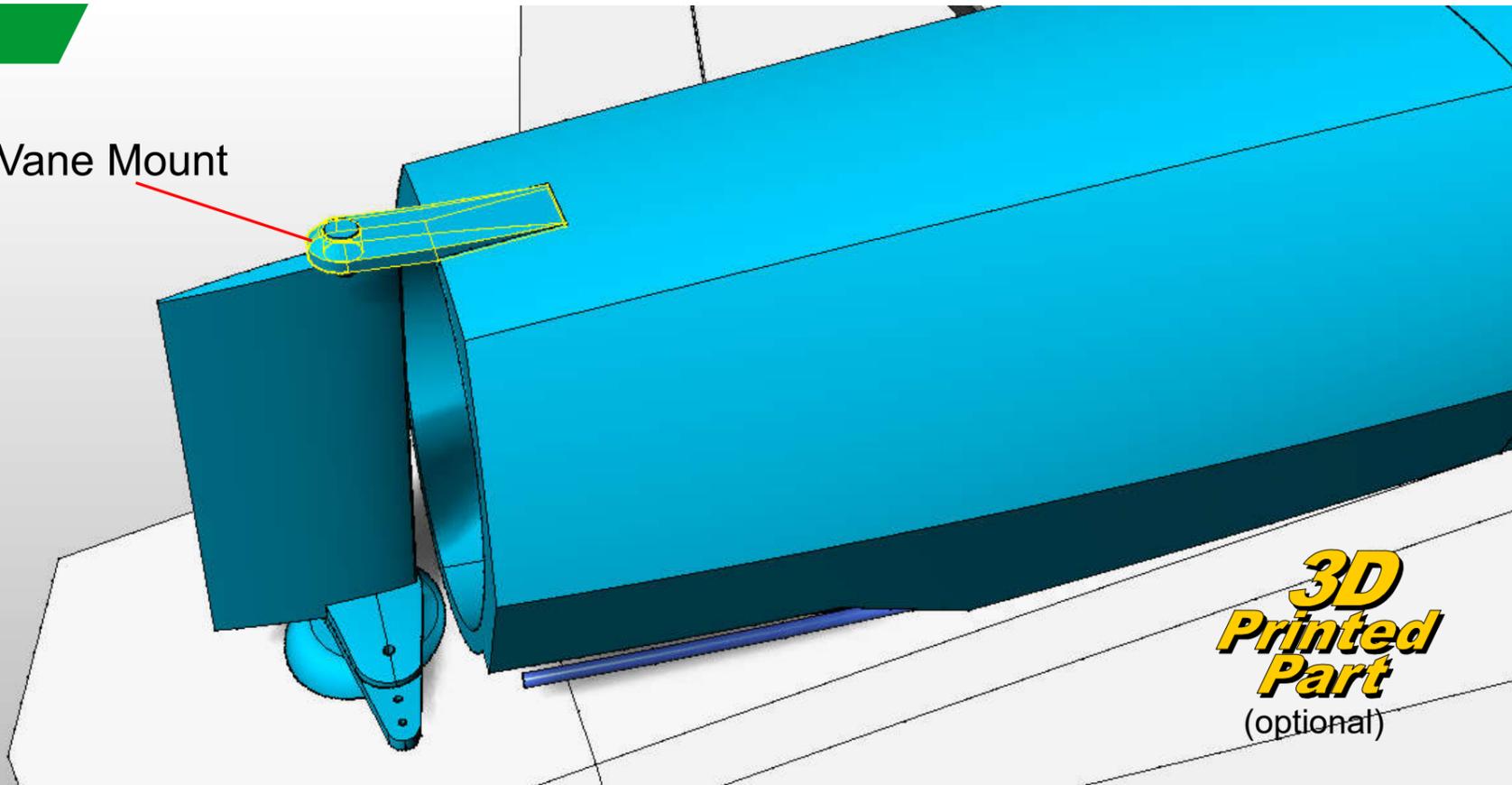


Using a drop of UHU por, fit the **Rudder Vane** to the Rudder Shaft. Fix further with two M2 brass machine screws.

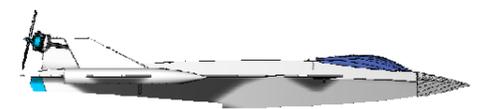
EDF only

Rudder Vane Mount

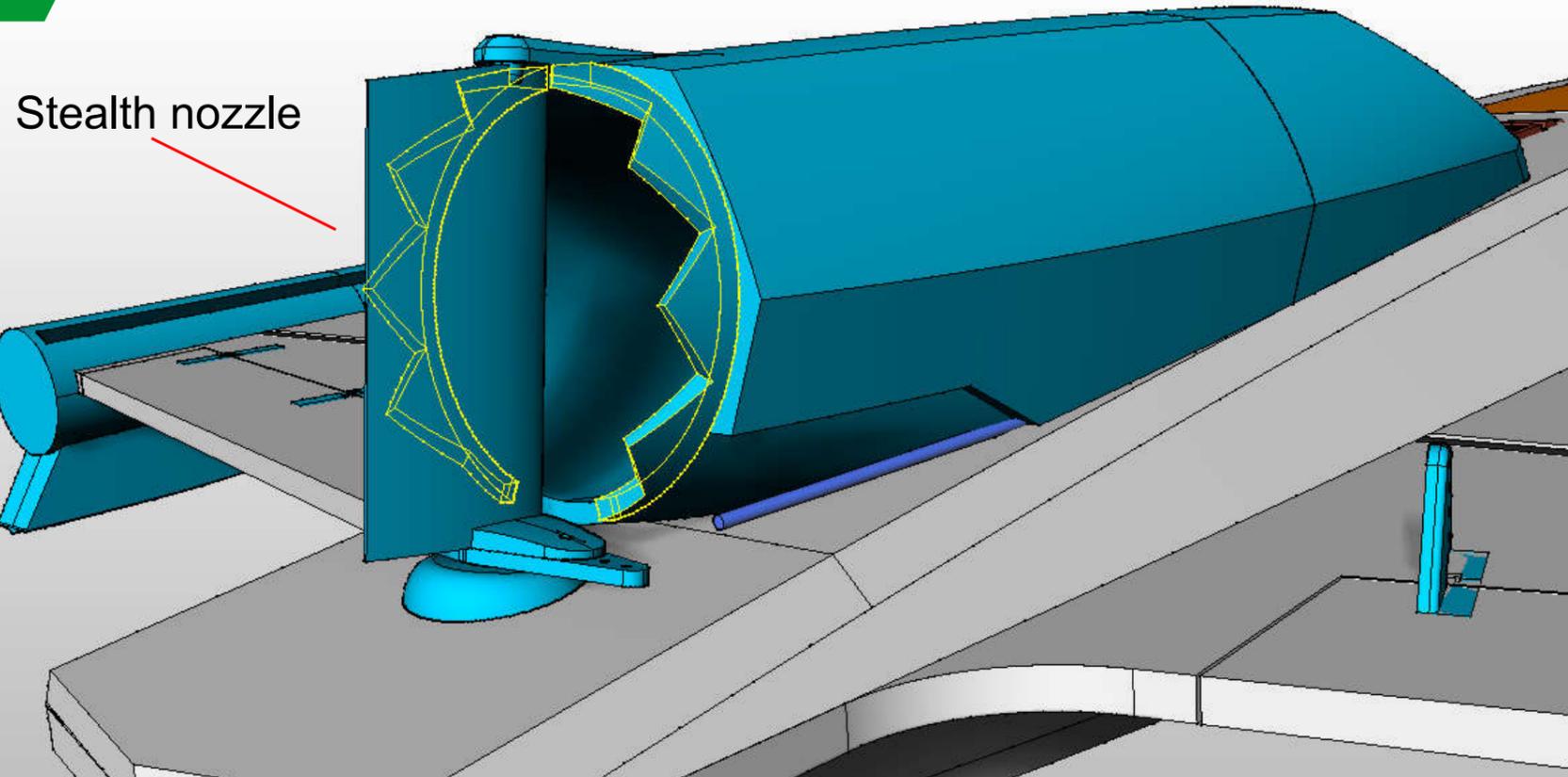
**3D
Printed
Part**
(optional)



Glue the **Rudder Vane** mount in place using superglue Gel.



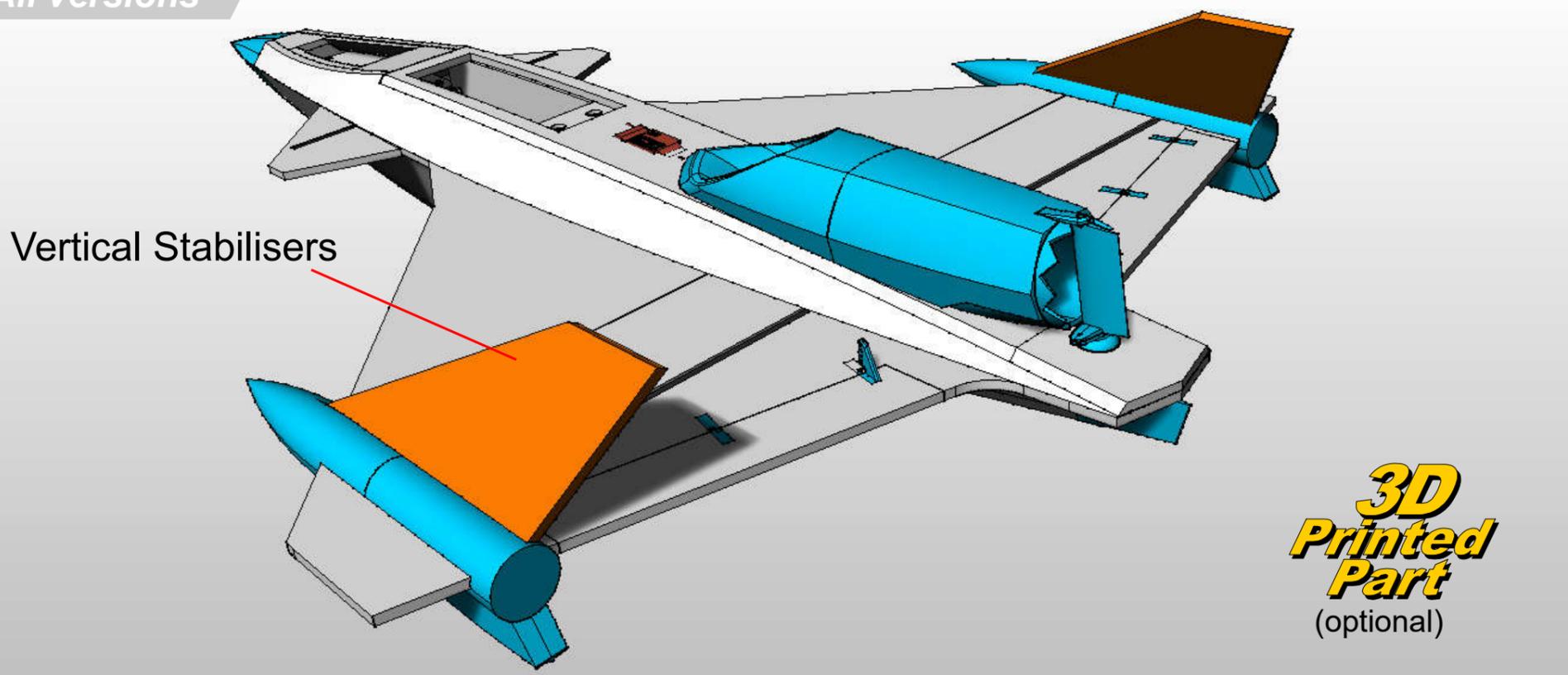
EDF only



Glue the **Stealth Nozzle** in place using Uhu Por. It consists of a mirrored pair of half circles.



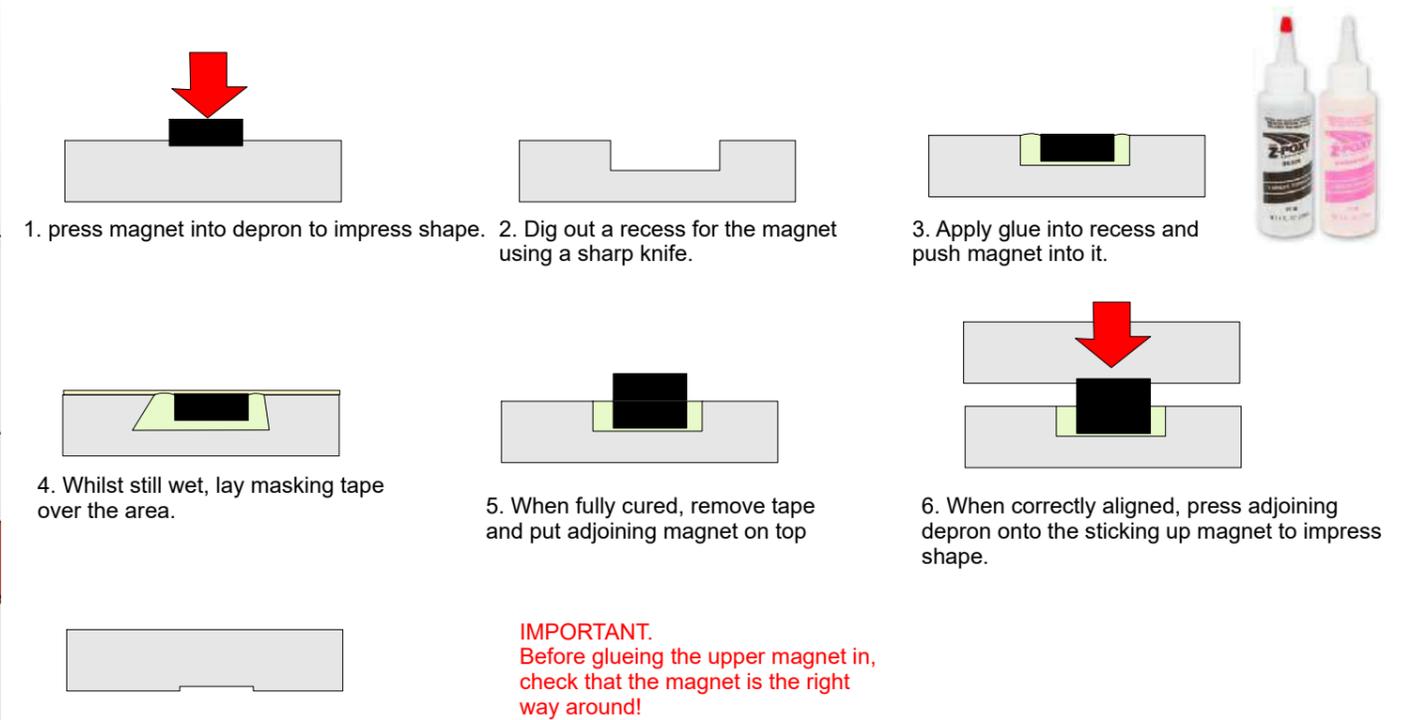
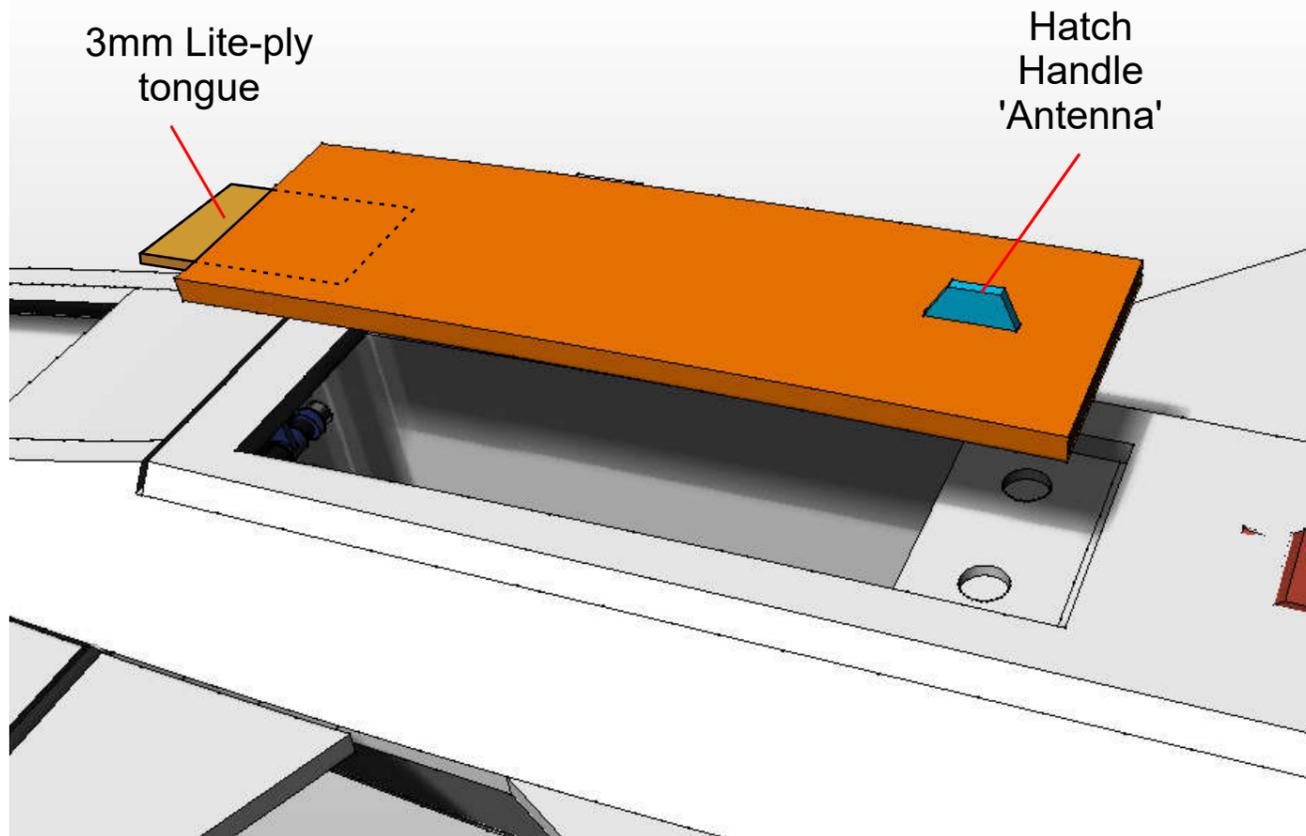
All versions



Glue the two wing mounted **Vertical stabilisers** in to the slots in the Wing Bullets.

For the pusher version you can omit these and fit the **Large Single Vertical Stabiliser** in place if you prefer.

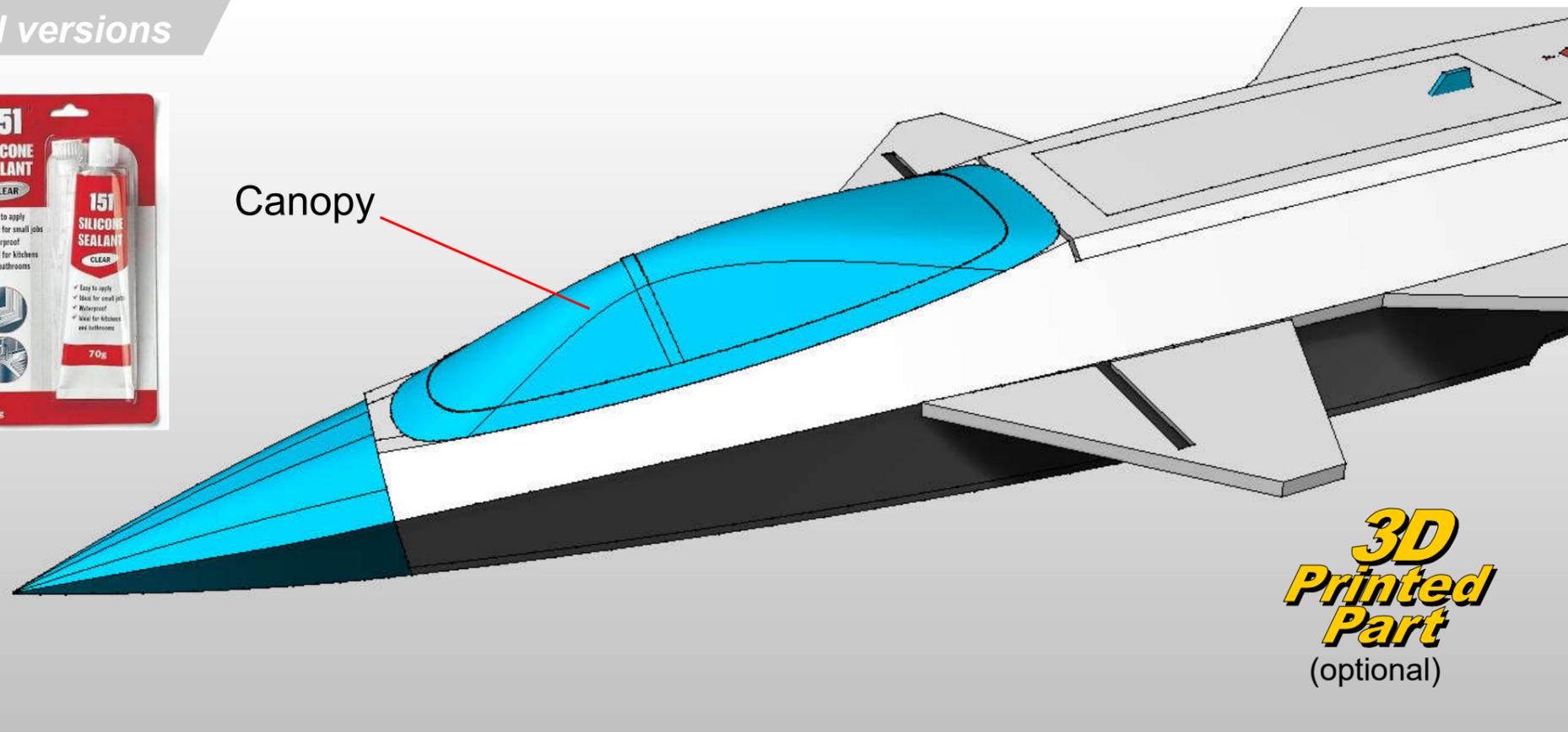




All versions



Canopy

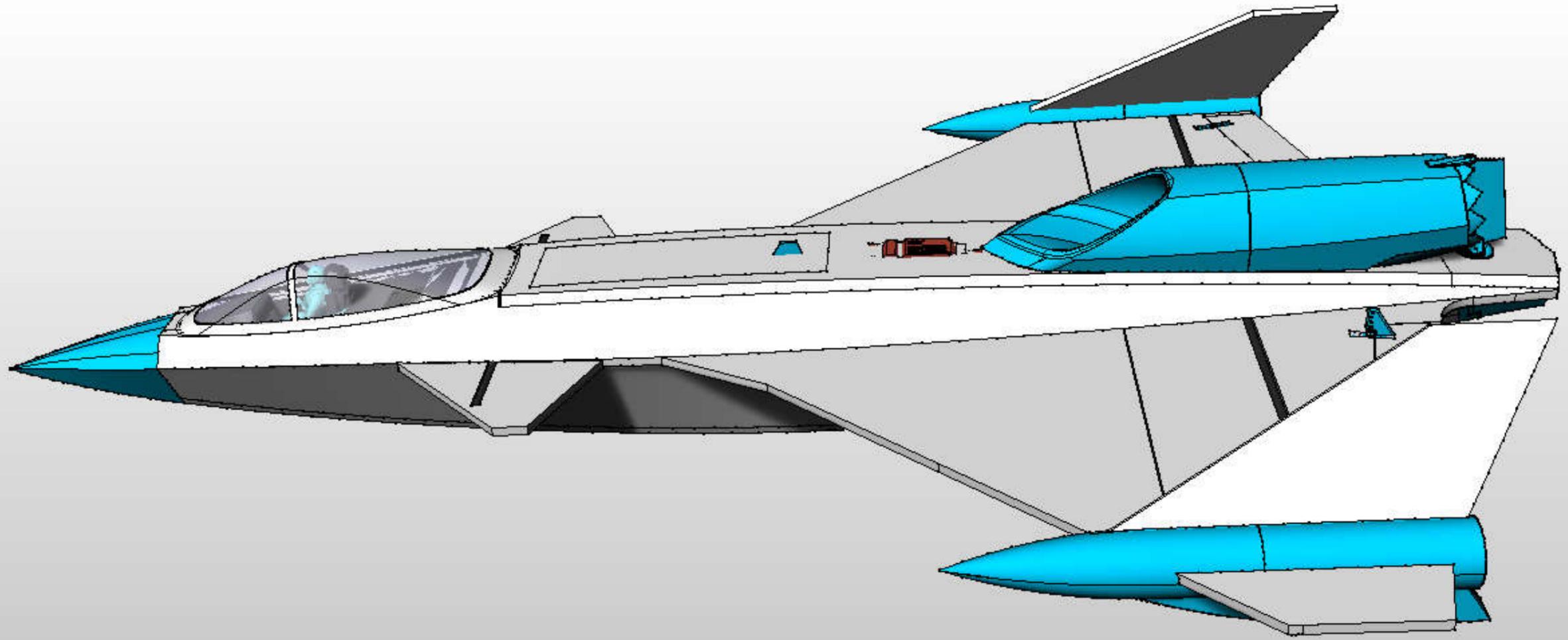


Glue a lite ply tab on the front underside of the battery access hatch, and a handle at the rear. Ensure you can tape the seal to prevent water ingress.

Attach magnets as shown above.

Sand the area behind the nosecone to create a seamless surface between the nose and canopy. Glue the Canopy to the Fuselage using silicone sealant.



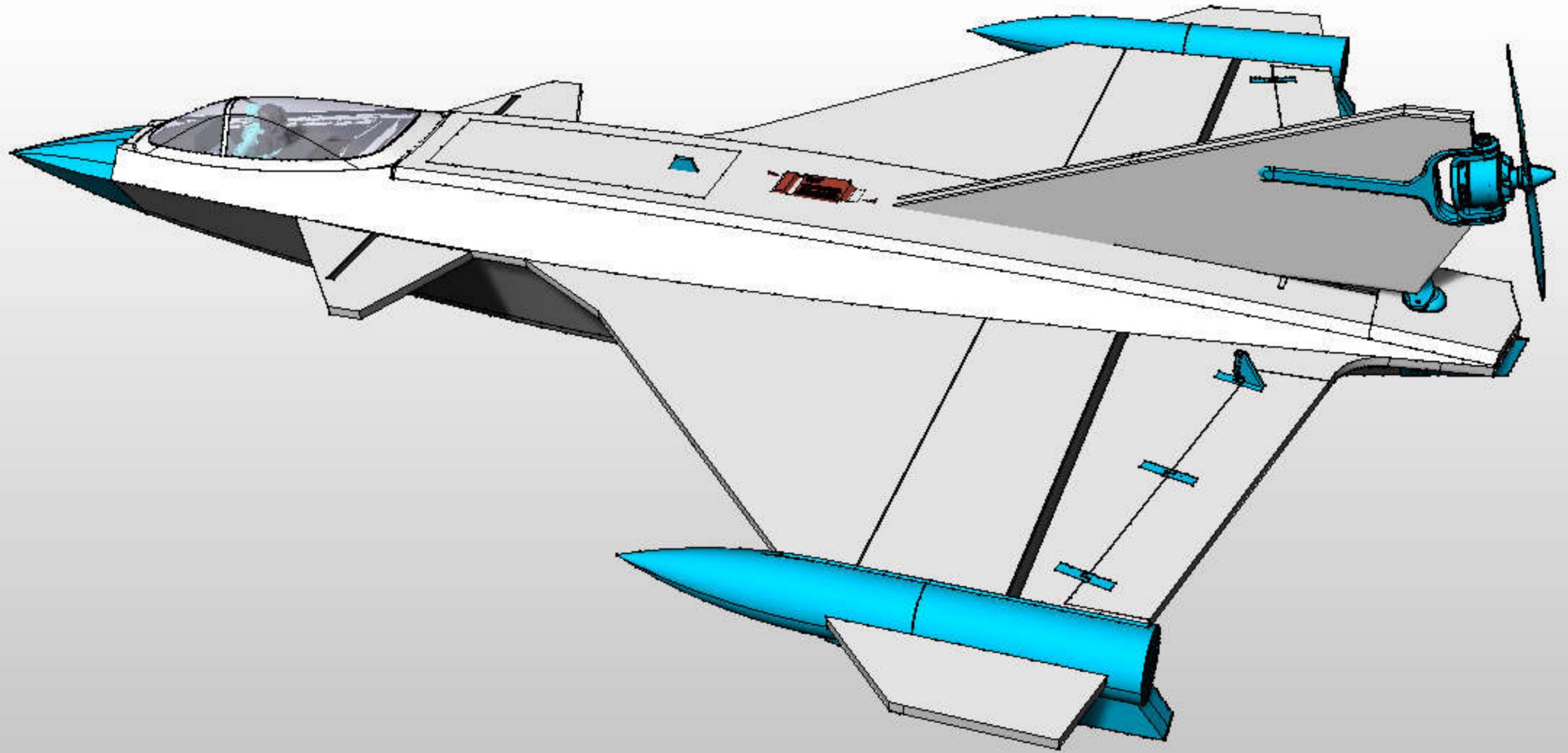


64mm EDF version

Congratulations! Your model is now complete.

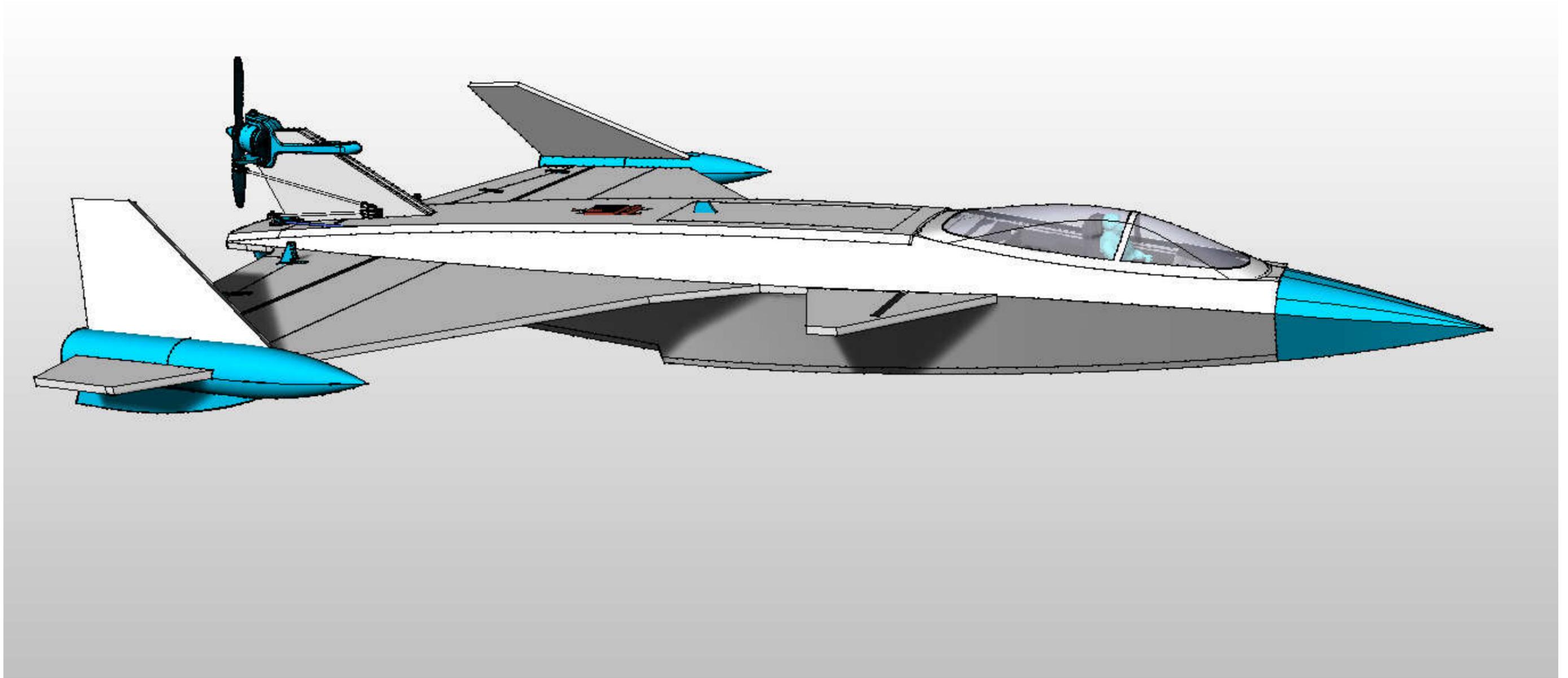
Before putting it in the water, I suggest you prepare the surface and paint it with acrylic paints to give it an increased water resistance, followed with Gloss Water based Floor Varnish. I recommend using Helicopter Tape (or similar) on the belly to give it some durability.





Single Vertical Stabiliser Pusher Version





Triple Vertical Stabiliser Pusher Version

