JETWORKS


# Sukhoi Su-34
# Fullback

Photograph of actual aircraft.

4th Generation Fighter Jet

**Construction Guide**

# Fullback History

The Sukhoi Su-34 (Russian: Сухой Су-34; NATO reporting name: Fullback) is a Soviet-origin Russian twin-engine, twin-seat, all-weather supersonic medium-range fighter-bomber/strike aircraft.  It first flew in 1990, intended for the Soviet Air Forces, and it entered service in 2014 with the Russian Air Force.

Based on the Sukhoi Su-27 Flanker air superiority fighter, the Su-34 has an armored cockpit for side-by-side seating of its two-person crew. The Su-34 is designed primarily for tactical deployment against ground and naval targets (tactical bombing/attack/interdiction roles, including against small and mobile targets) on solo and group missions in daytime and at night, under favourable and adverse weather conditions and in a hostile environment with counter-fire and electronic Warfare (EW) counter-measures deployed, as well as for aerial reconnaissance.  The Su-34 will eventually replace the Su-24 tactical strike fighter and the Tu-22M3 long-distance bomber.

Russia is developing two new versions of the aircraft: one for electronic warfare (L700 Tarantul ECM pod can provide electronic cover for a group of aircraft) and one for Intelligence, surveillance, and reconnaissance.  Su-34M modernised version will feature a new electro-optical infrared targeting pod, a Kopyo-DL rearward facing radar that can warn the pilots if missiles are approaching, combined with automatic deployment of countermeasures and jamming.

The total number of operational aircraft delivered to the Russian Air Force is 129 (not counting crashes and aircraft written off). On 25 August 2020, the Russian Defence Ministry signed third contract to deliver a further 24 Su-34 aircraft for the Russian Air Force. The deliveries will stretch over 3 years.

**Design**

The Su-34 shares most of its wing structure, tail, and engine nacelles with the Su-27/Su-30, with canards like the Su-30MKI, Su-33, and Su-27M/35 to increase static instability (higher manoeuvrability) and to reduce trim drag.

The Su-34 is powered by a pair of Saturn AL-31FM1 turbofan engines, giving the aircraft a maximum speed of Mach 1.8+ when fully loaded. Although having a slower maximum speed than the standard Su-27, the Su-34 can still handle high G-loads and perform aerobatic manoeuvres. When equipped with a full weapons load, the Su-34 has a maximum range of 4,000 kilometres (2,500 mi) without refuelling, this can be extended further via aerial refuelling. The airframe is also cleared to perform manoeuvres of up to +9 g The noise level of the Su-34 is two times lower than the level of its predecessors.

The Su-34 is a three-surface design having both a conventional horizontal tailplane at the rear and a canard foreplane in front of the main wings. The foreplane provides both additional lift (force) and greater maneuverability. It has twin tail fins like those of Su-27 from which it is derived. The Su-34 has 12 hardpoints for 8,000 kg (17,600 lb) of ordnance, intended to include the latest Russian precision-guided weapons. It retains the Su-27/Su-30's 30 mm GSh-30-1 cannon, and the ability to carry R-77 air-to-air missiles (6 pcs) and R-73 (also 6), with the air-to-air missiles being primarily for defense against pursuers if detected by the rearward facing radar.[13] The maximum weight of any single munition carried is 4000 kg, its stand-off weapons have range up to 250 kilometres (160 mi). A Khibiny electronic countermeasures (ECM) system is fitted as standard.

# Designers Notes

A very unusual looking plane, but a potent adversary excelling in both fighting and bombing roles.

Like the original plane, I've based on the Su-27 design, so it should be an excellent flyer and will attract attention at the flying field!



# 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-baloons 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!)

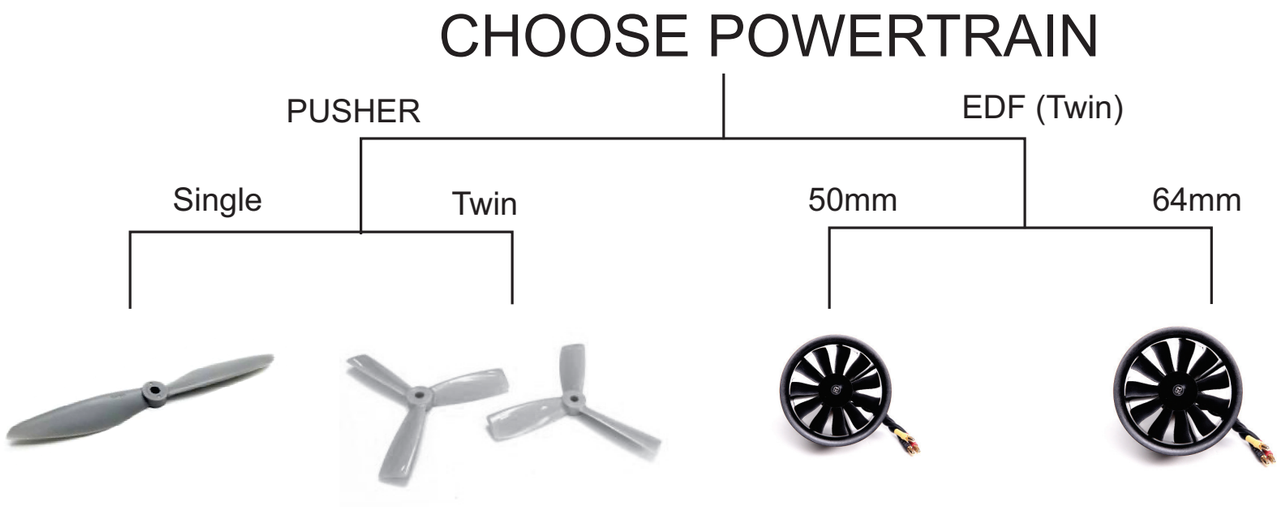
IMPORTANT Wherever the plans call for marking guidelines onto the depron, please ensure that you do otherwise it can cause problems later on. I suggest you use a Sharpie Fineliner to transfer the lines.

**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.

This design can become quite heavy as 3d printed parts along with EDF Units or twin-axis pusher mechanisms add a surprising amount of weight.  It will fly with the weight, but you may need to bungee launch it depending on what components you choose.

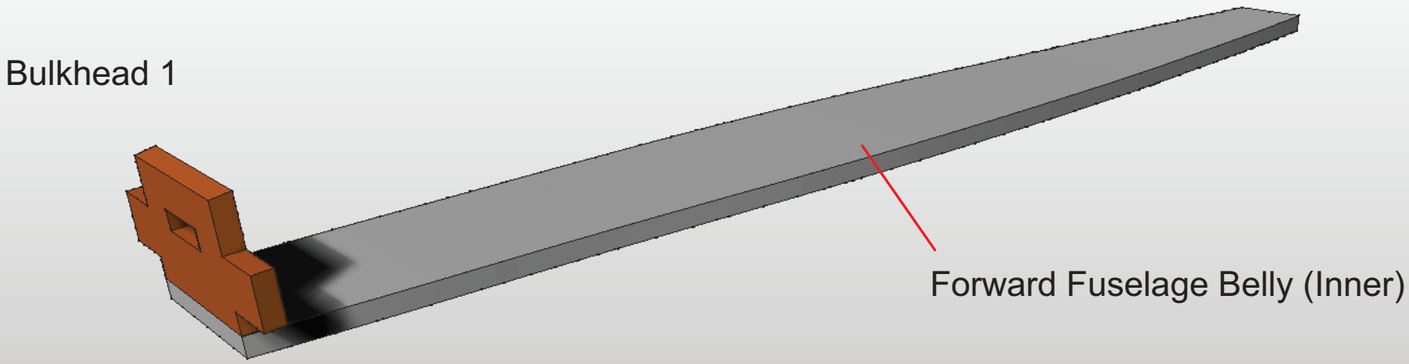
You can have a lot of fun with fixed canards, fixed pusher prop and simple elevator/aileron function keeping the wing loading light. (4 servos).  If you go for a 2 axis pusher with working canards, you will need 8 servos..  I recommend you choose Metal Geared servos only for elevator and the T/V system, using nylon for the Ailerons and Rudder to help keep weight down.

Regarding the EDF versions,  the 50mm EDF will provide lots of fun,  I suggest you choose the 64mm units only if you want to bungee launch and desire speed above all.  Print the 3d printable parts as light as you dare.  0.4mm wall, 5% infil on non structural parts.  40% infil on motor mounts etc.  Consider using Lightweight PLA.

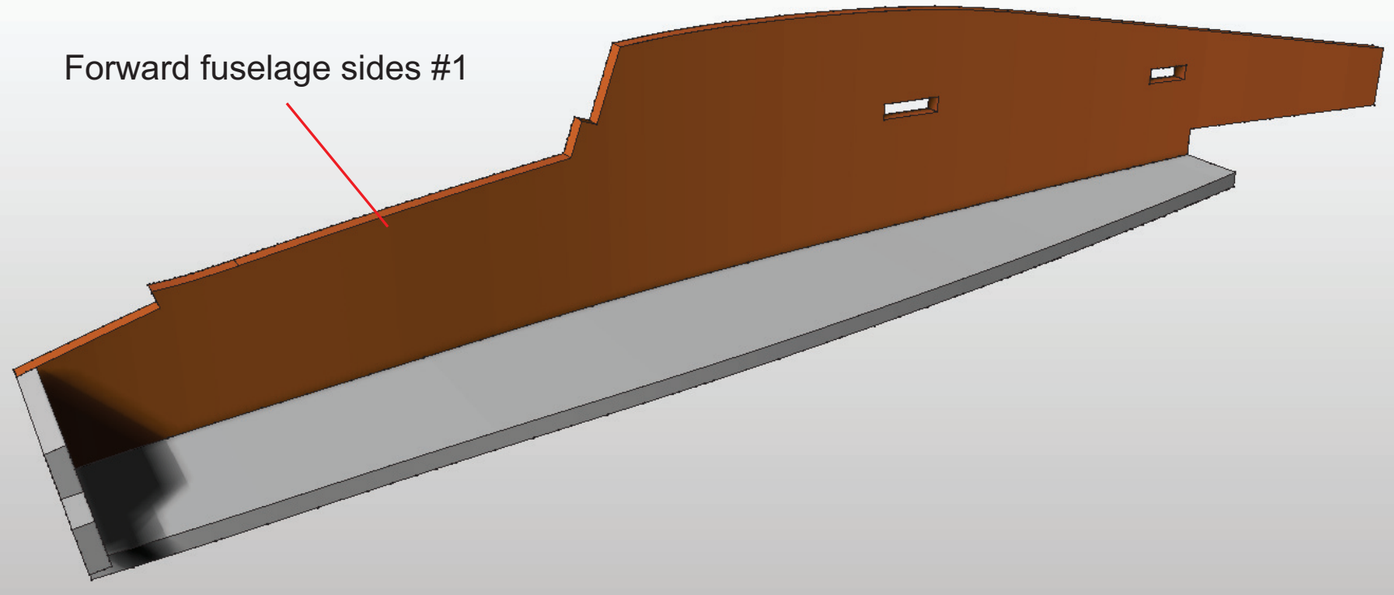



Choose your prefered variant and its powertrain. Caution : The more weight you add, it will need more assistance to take off (e.g. Bungee), and will need to land at higher speeds. XPS/Depron is not the most durable, so choose wisely.

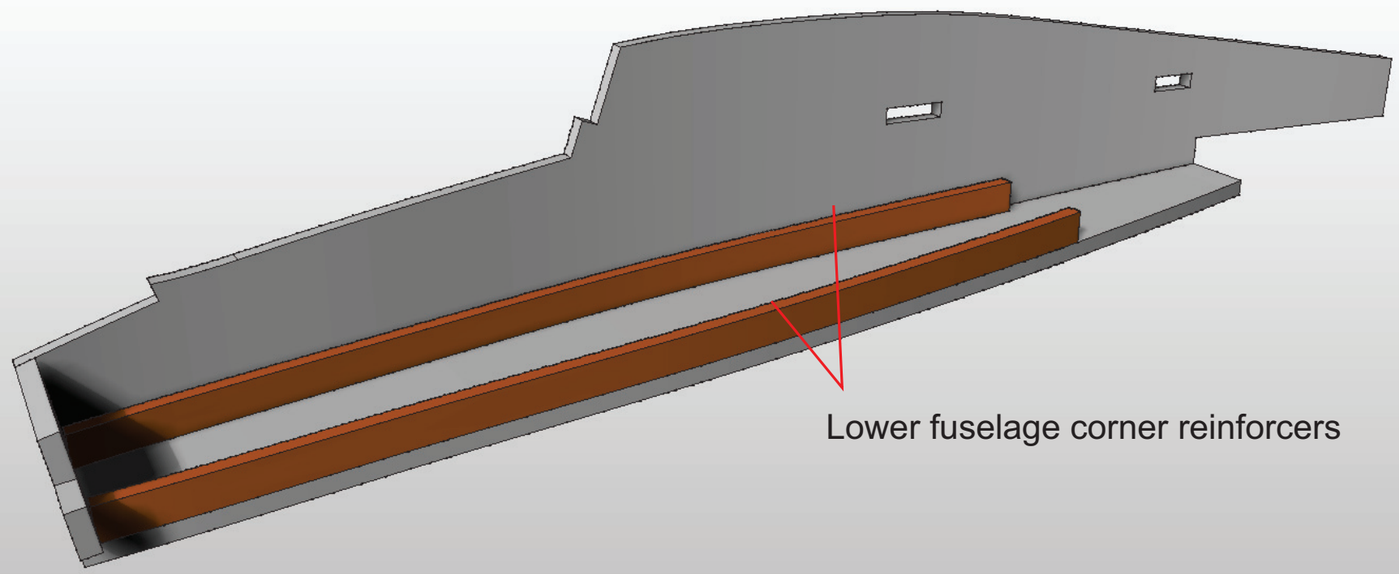
***All versions***




Glue **Bulkhead 1** to the **Forward fuselage Belly (Inner).**



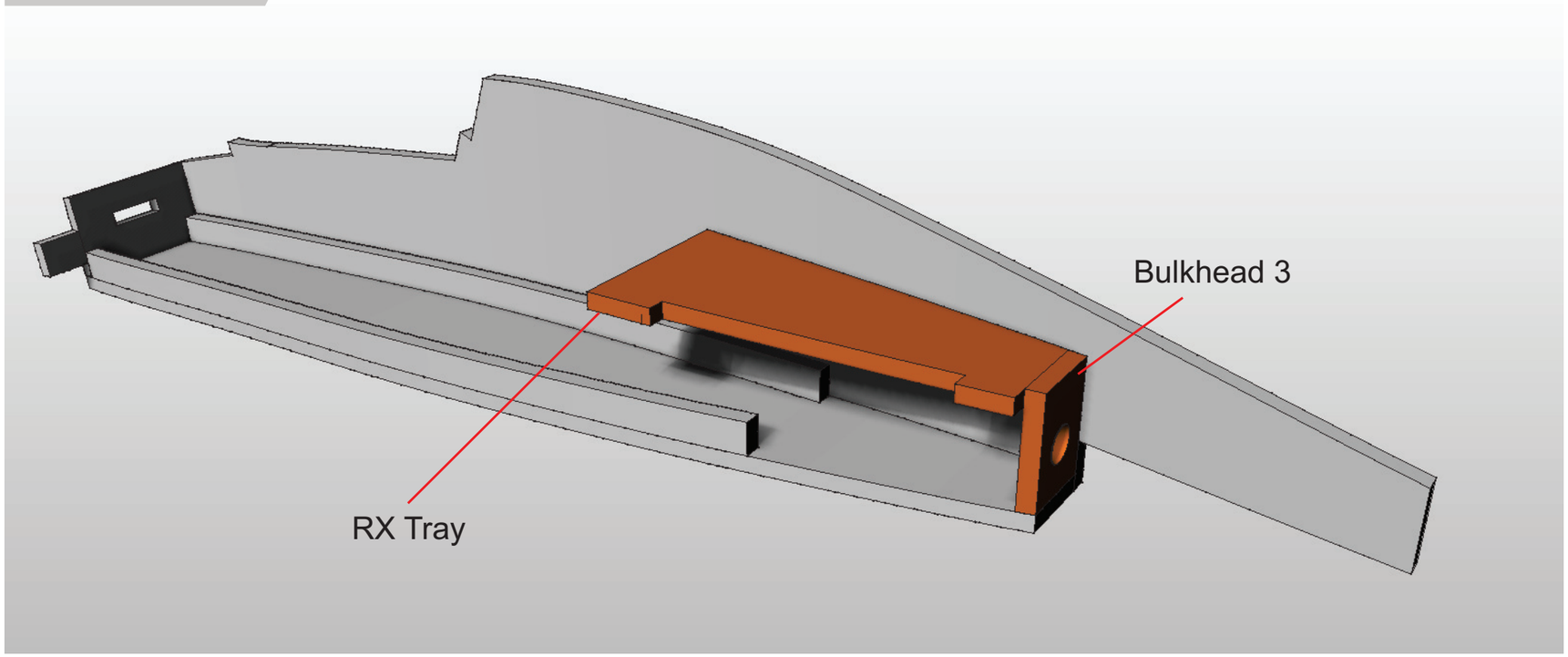

Glue ONE of the two the **Forward Fuselage sides #1** to the assembly.


Glue the **Lower Fuselage Corner Reinforcers** to the assembly.

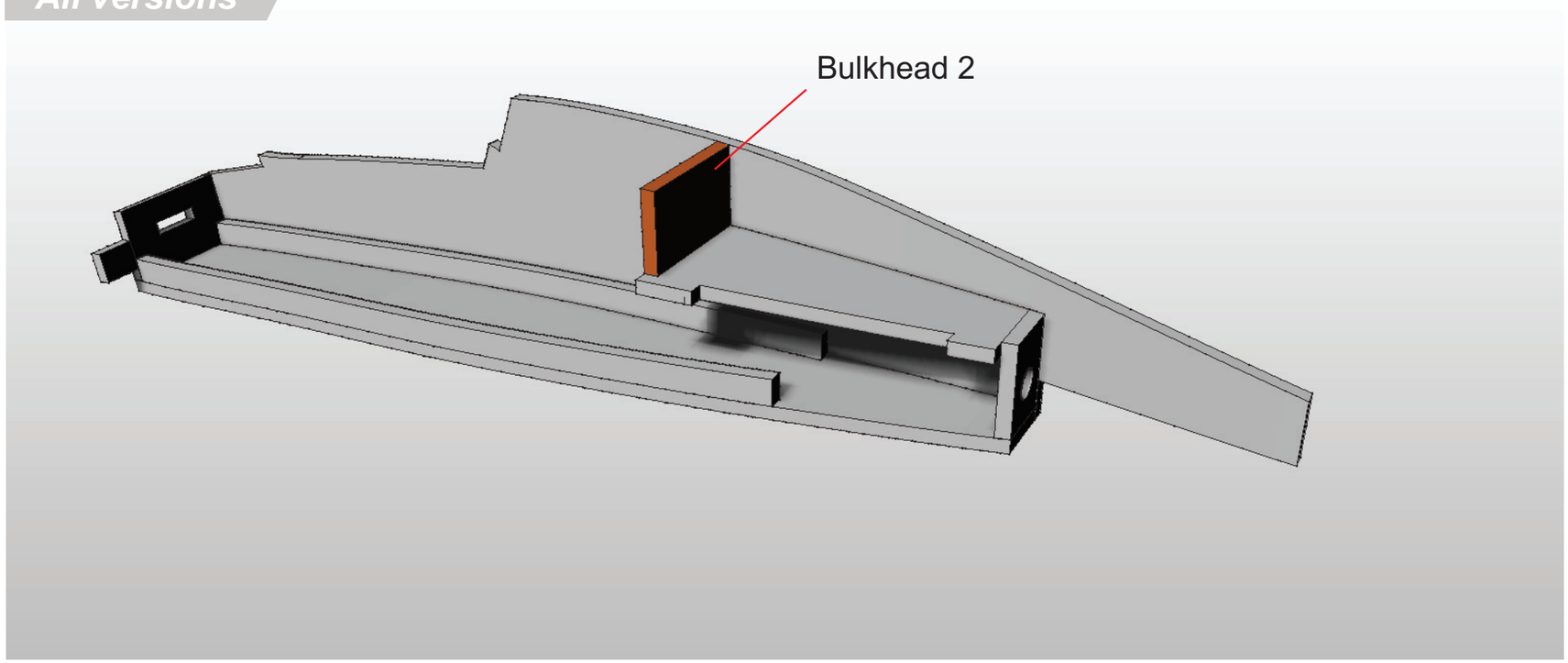



*All versions*




Glue the **RX Tray** and **Bulkhead 3** to the fuselage.

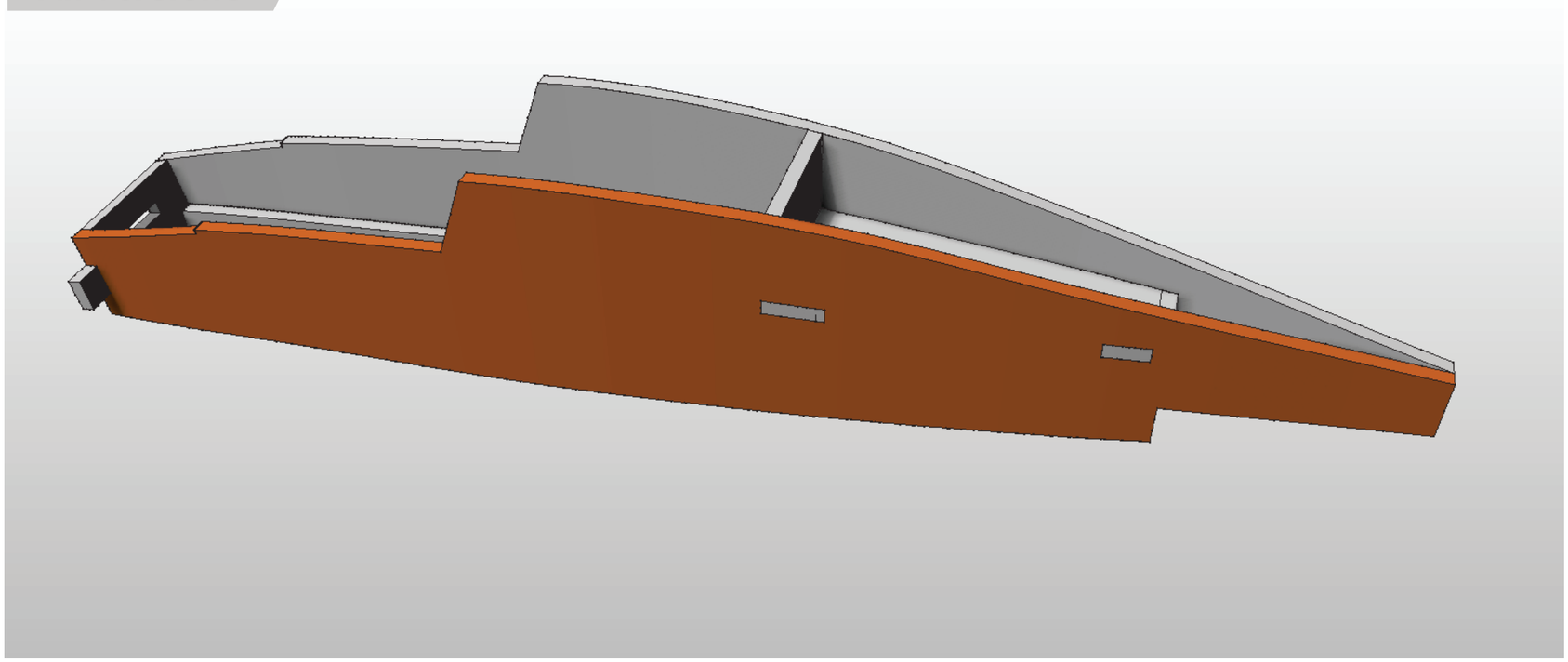

*All versions*




Glue **Bulkhead 2** to the fuselage.

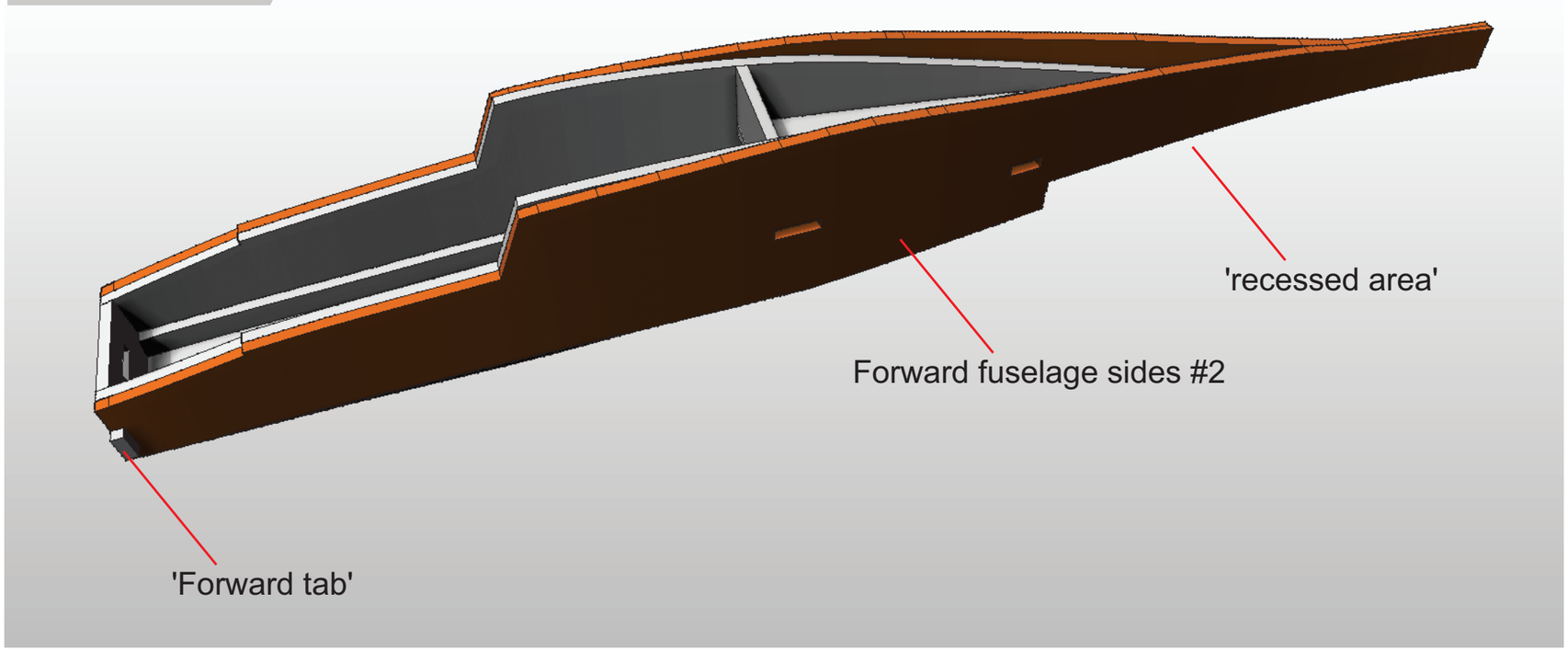



*All versions*



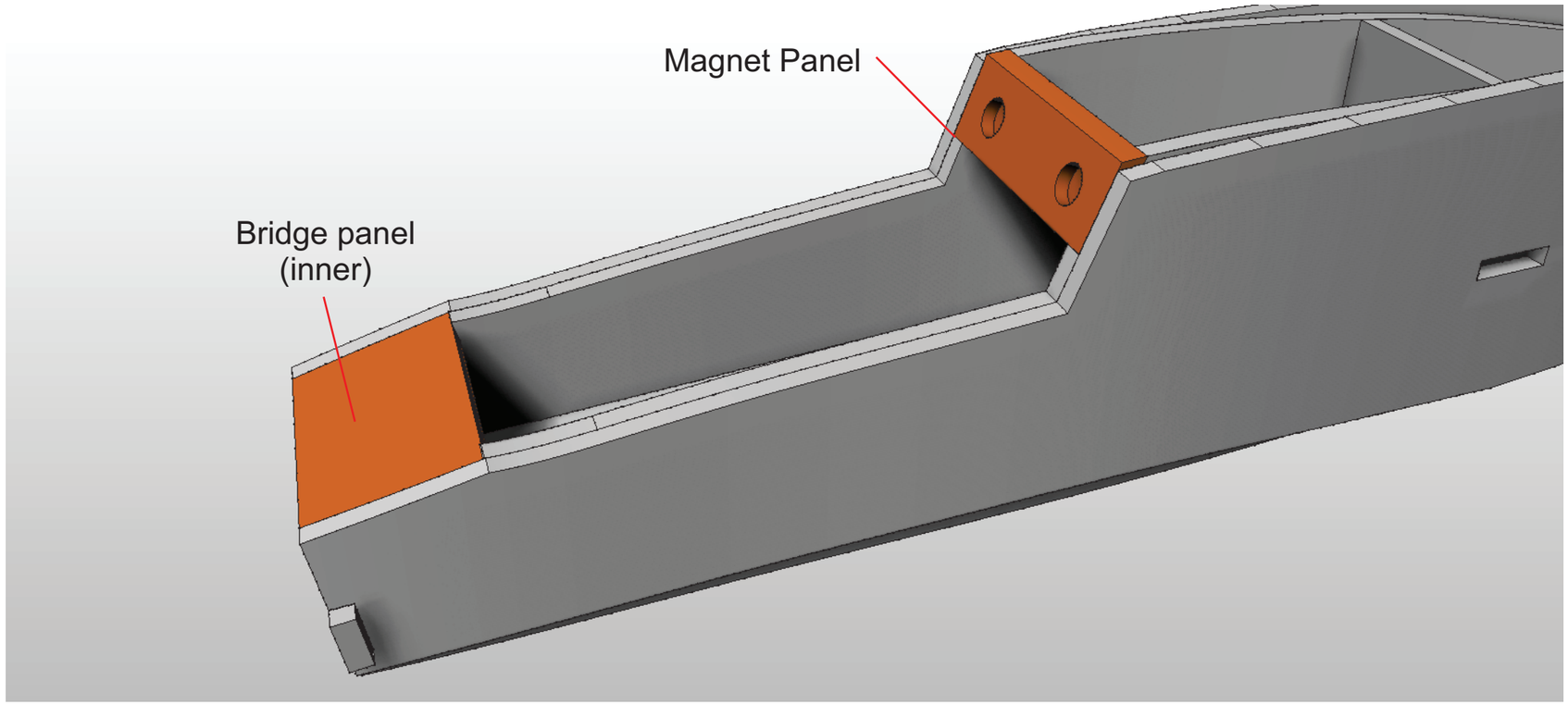
Glue the other fuselage side onto the assembly


*All versions*



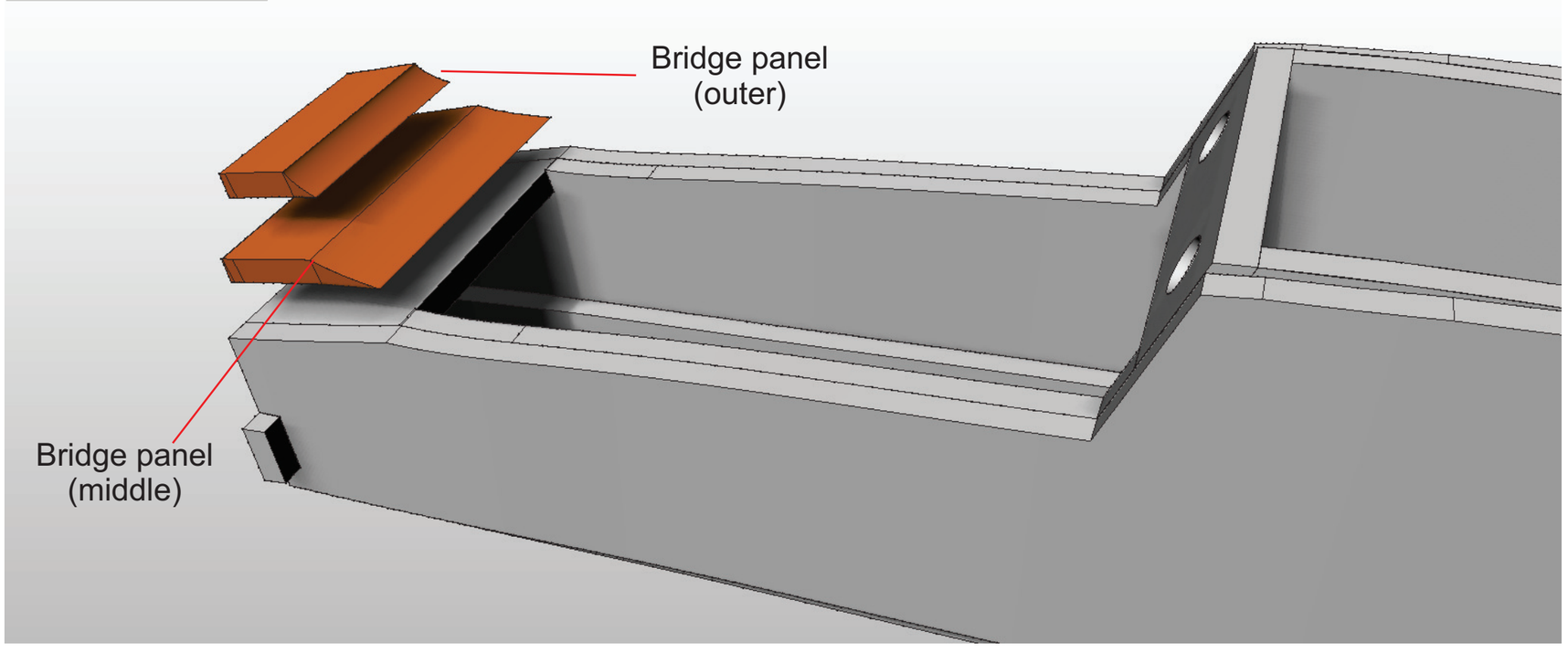

Glue the two the **Forward Fuselage sides #2** to the assembly - aligning on the forward tab, and the recessed area at the rear.






Using a little Epoxy, slide the **Bridge panel (inner)** and the **Magnet panel** into the assembly.

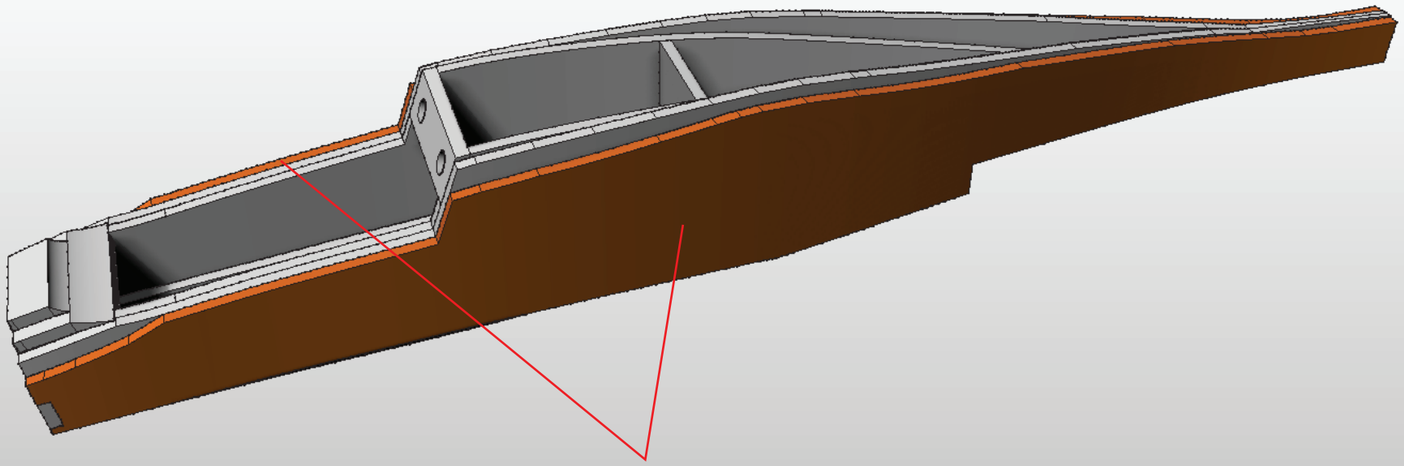
*All versions*




Glue **Bridge panel (Middle)** and **Bridge Panel (Outer)** to the fuselage.



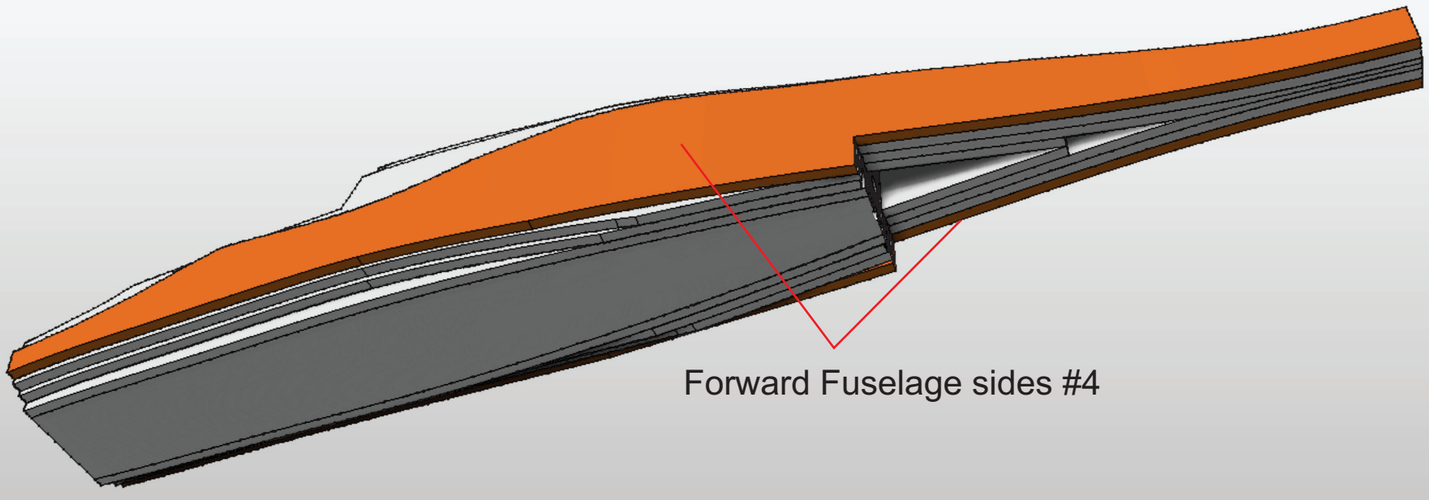

*All versions*



Forward Fuselage sides #3

Glue the **Forward fuselage sides #3** onto the fuselage aligning using the tab on **Bulkhead 1** and matching the shape at the rear of the fuselage.

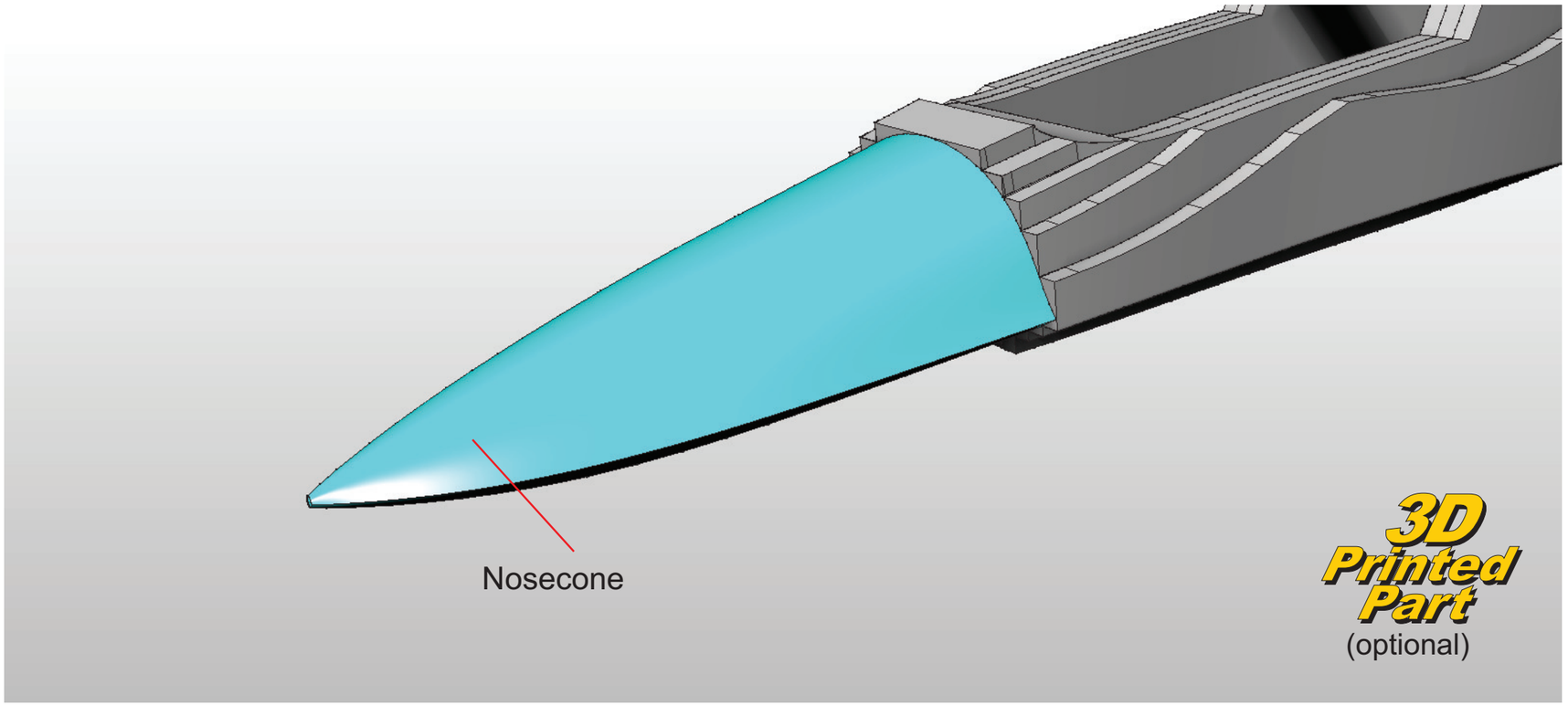

*All versions*



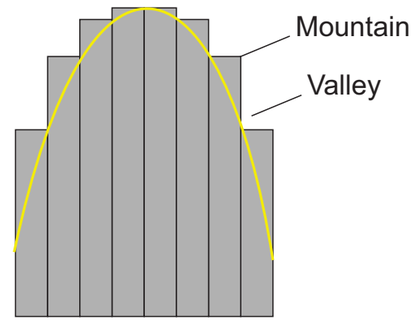
Forward Fuselage sides #4

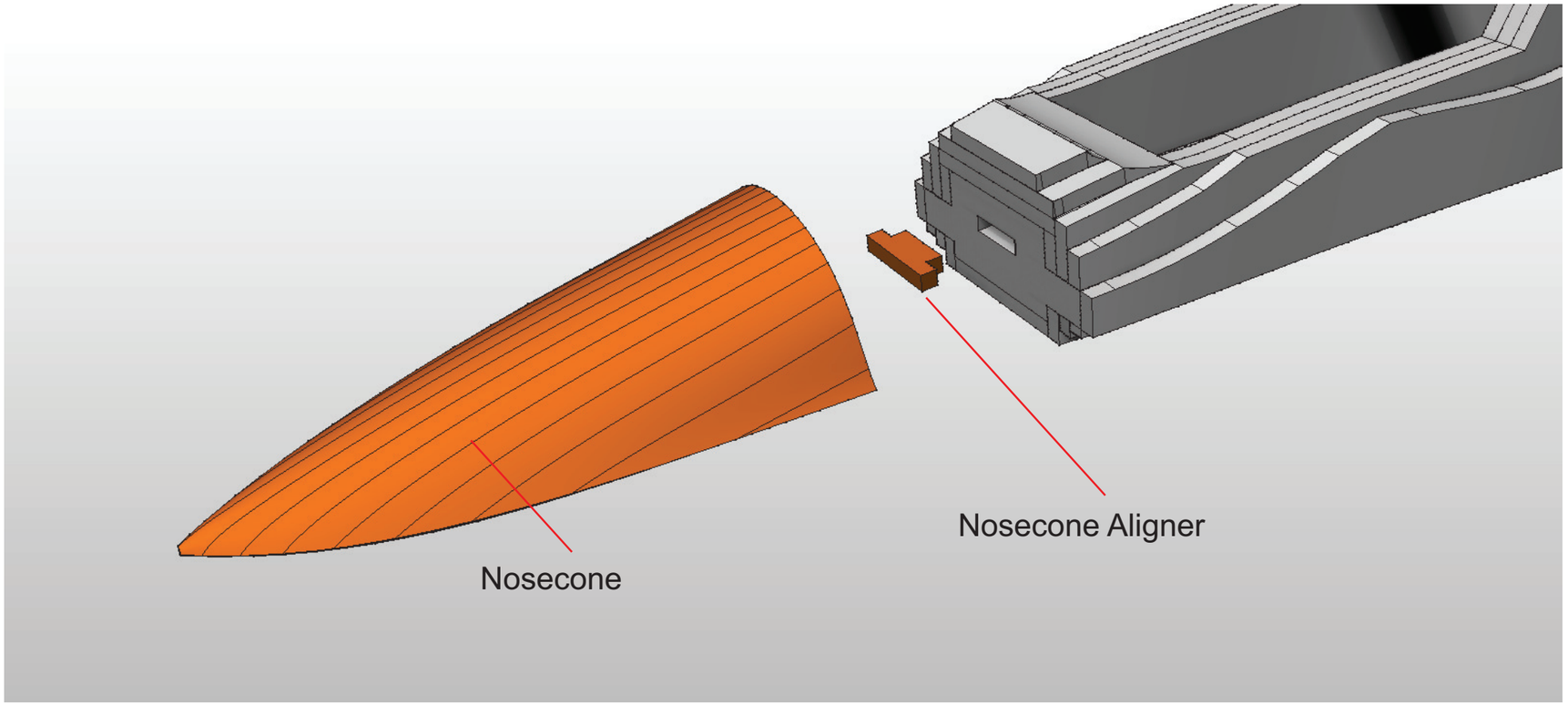
Glue the **Forward fuselage sides #**4 onto the fuselage aligning using the tab on **Bulkhead 1** and matching the shape at the rear of the fuselage.



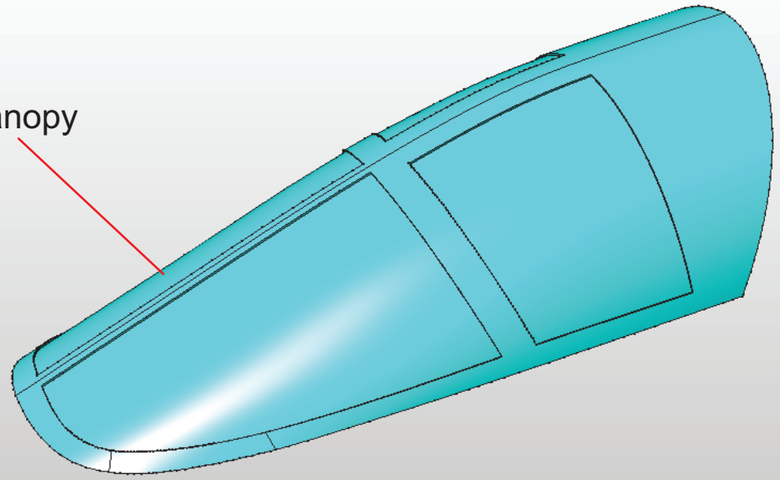

Create either a 3d printed Nosecone or a nosecone consisting of layers of foam sanded to get the right shape, by removing the ‘mountains’ until the ‘valleys’ are no more.




Glue the **Nosecone** to the assembly using the **Nosecone aligner** to ensure accurate positioning

*All versions*

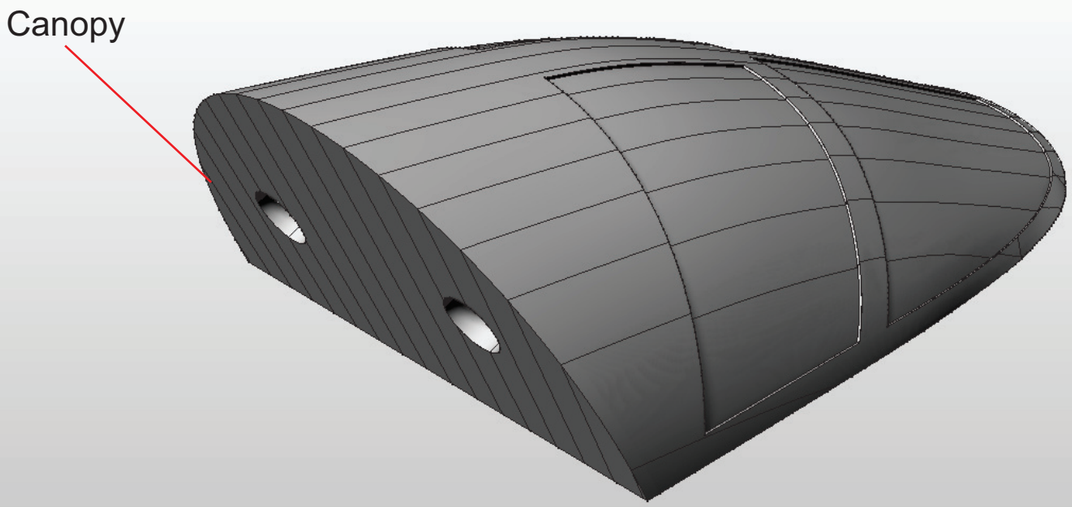


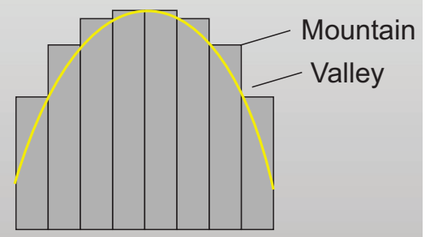

3D Printed Part
(optional)

Create either a :-
- 3d printed Canopy
- Vac formed canopy
- Laminated Canopy

a laminated canopy consists of layers of foam sanded to get the right shape, by removing the ‘mountains’ until the ‘valleys’ are no more.

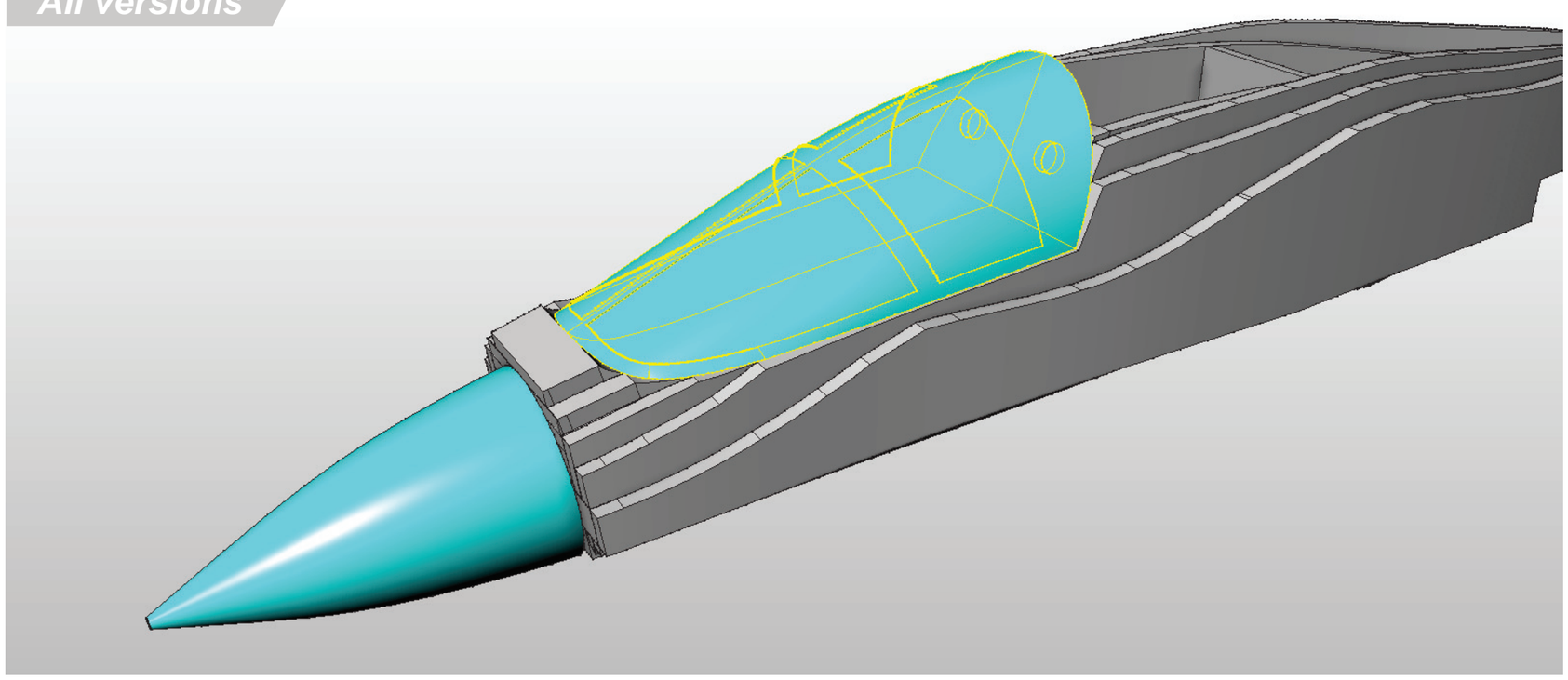
*All versions*



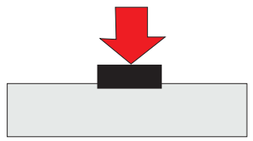







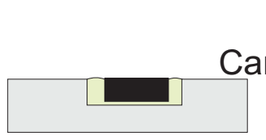


Add magnets and tongue as shown. .



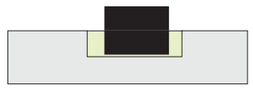
1. press magnet into depron to impress shape.

2. Dig out a recess for the magnet using a sharp knife.

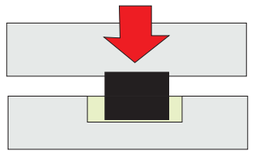


3. Apply glue into recess and push magnet into it.

4. Whilst still wet, lay masking tape over the area.

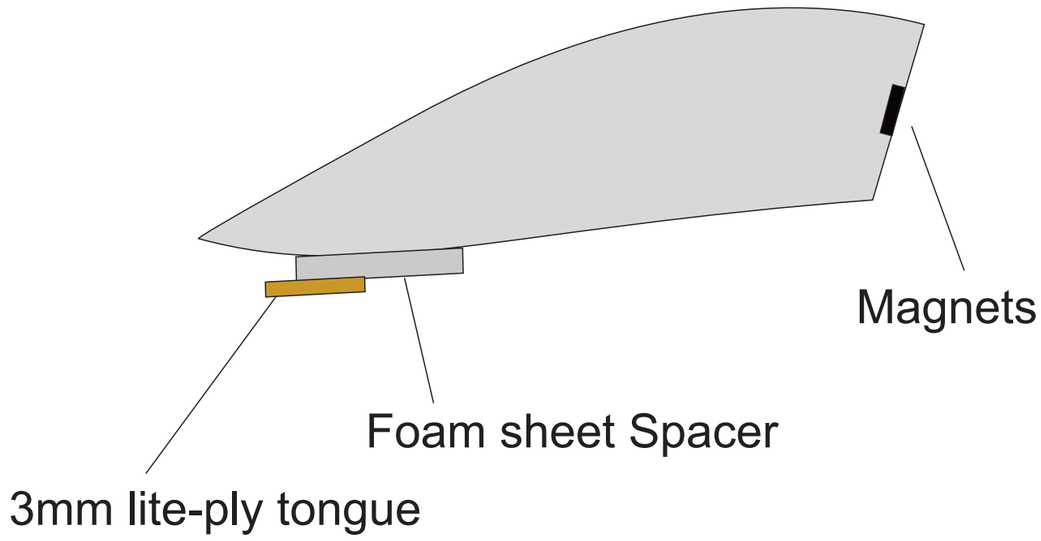


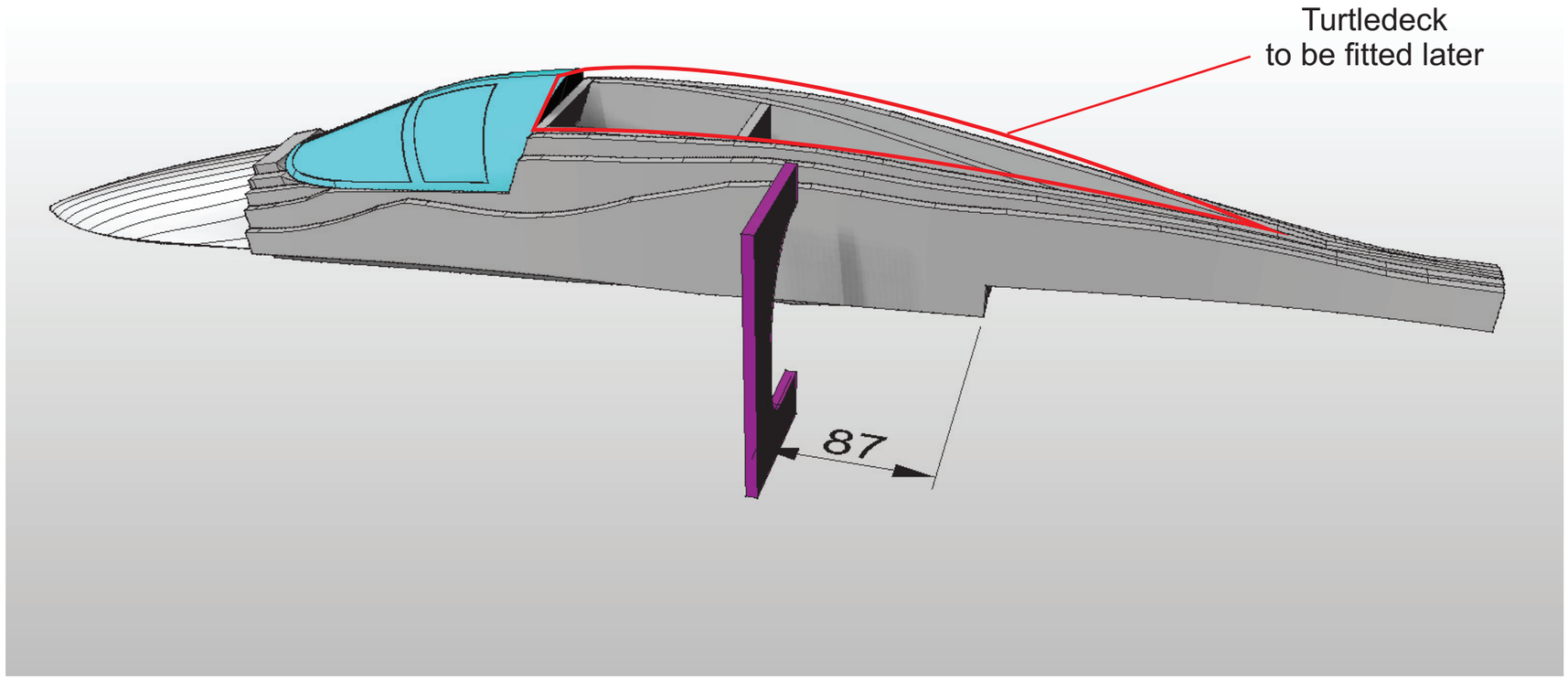
5. When fully cured, remove tape and put adjoining magnet on top



6. When correctly aligned, press adjoining depron onto the sticking up magnet to impress shape.

IMPORTANT.
Before glueing the upper magnet in, check that the magnet is the right way around!

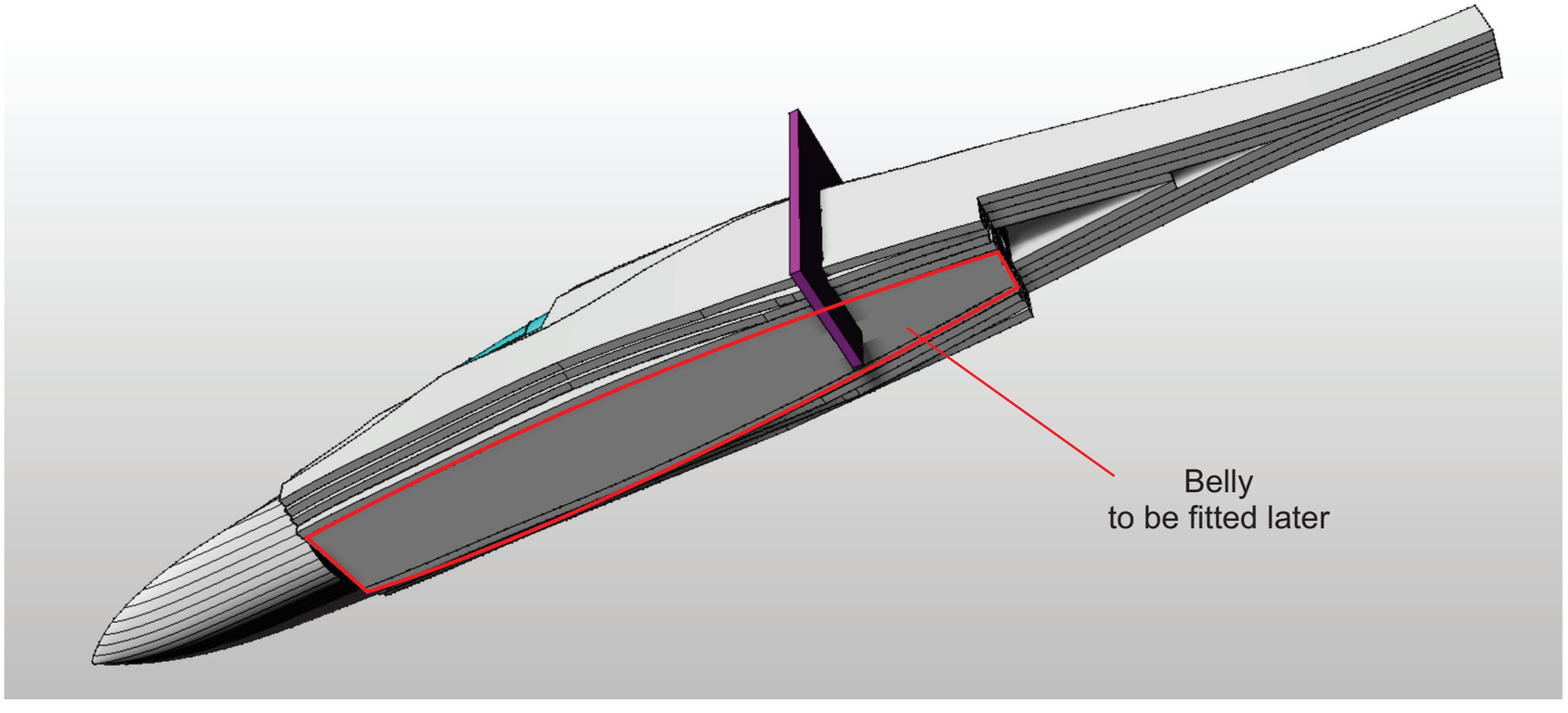




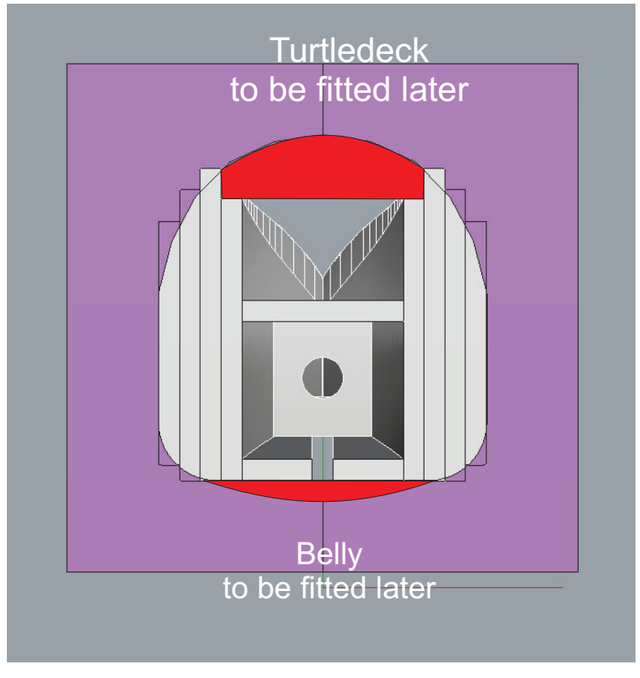

Before the fuselage becomes more difficult to sand to shape, start the sanding process (even though at this stage the turtledeck and belly are incomplete). If you prefer, you could temporarily attach the missing parts to help you.

Use the shape of the nosecone and Jig as a guide to getting the right shape as close as you can. You will be able to finish it later after the electronics are installed and the rear fuselage is attached.

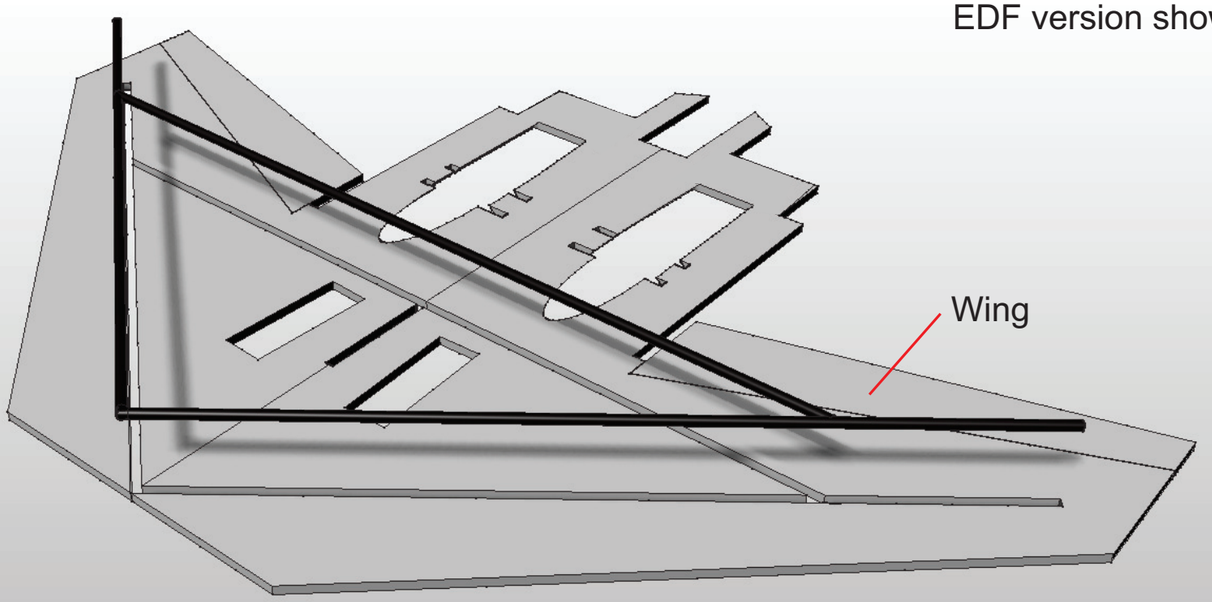
Glue the **Canopy** to the **Canopy base**.




SECTION VIEW

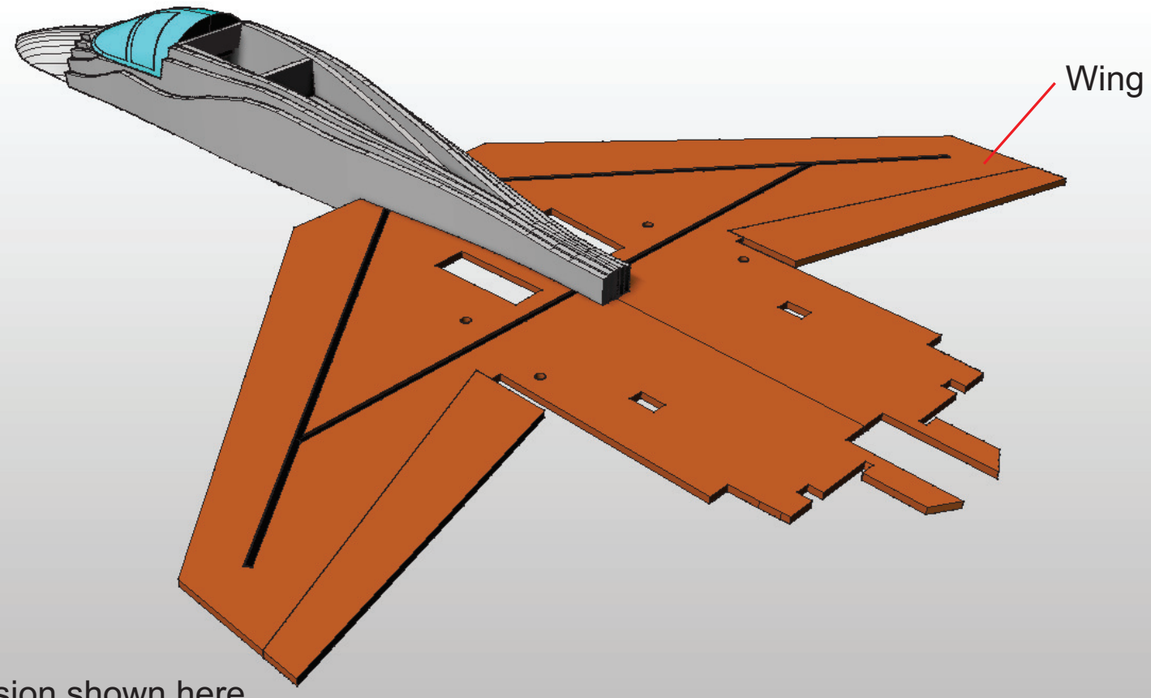


EDF version shown here




Glue the 6mm Carbon tube into the slots in the **Wing** using masking tape and Epoxy.

*All versions*




Wing - Pusher version shown here

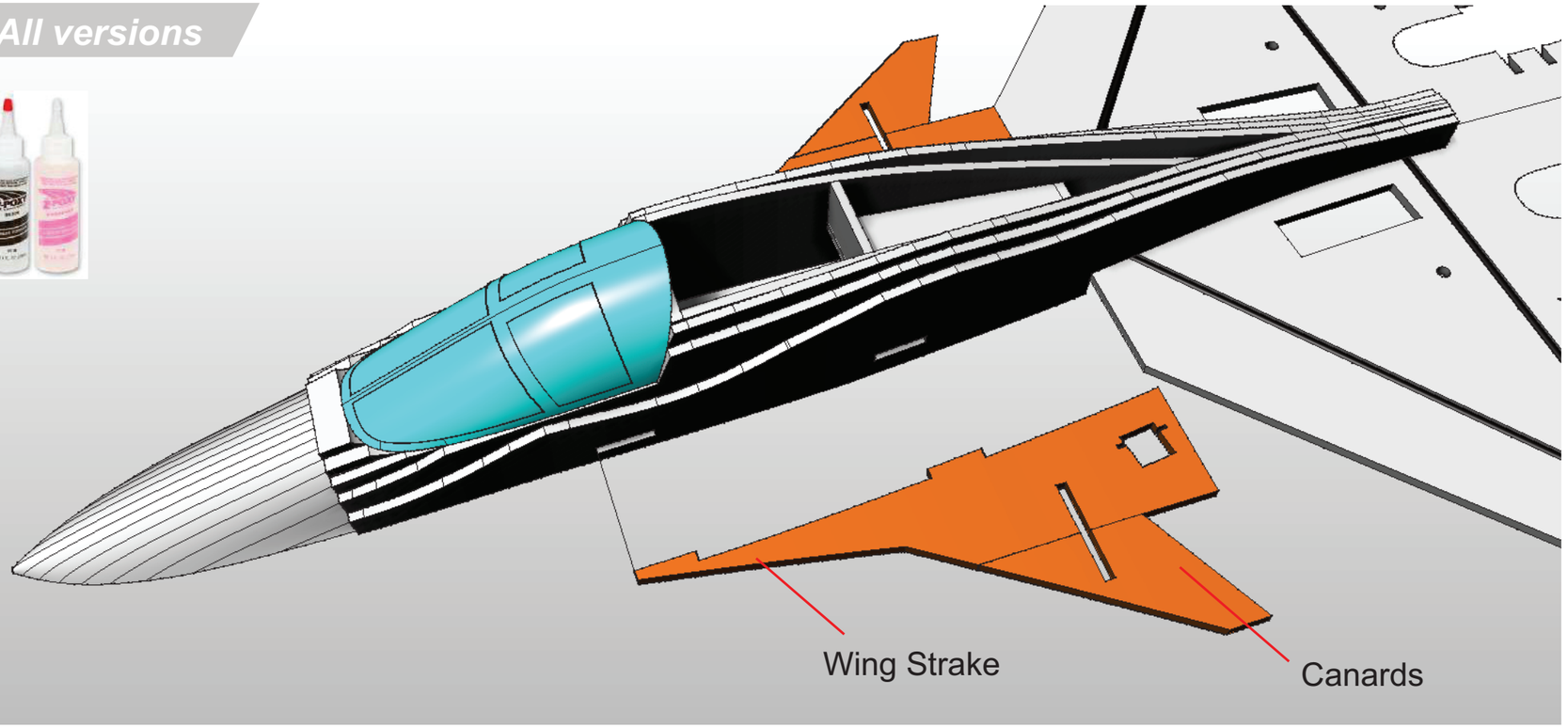
Mark a centreline on the wing - both upper and lower sides.

Using a sanding block, carefully sand the mating surface on the forward fuselage smooth in order to get good adhesion.

Very carefully align the two parts to ensure the assembly is straignt, the glue together.




*All versions*




## FIXED CANARDS

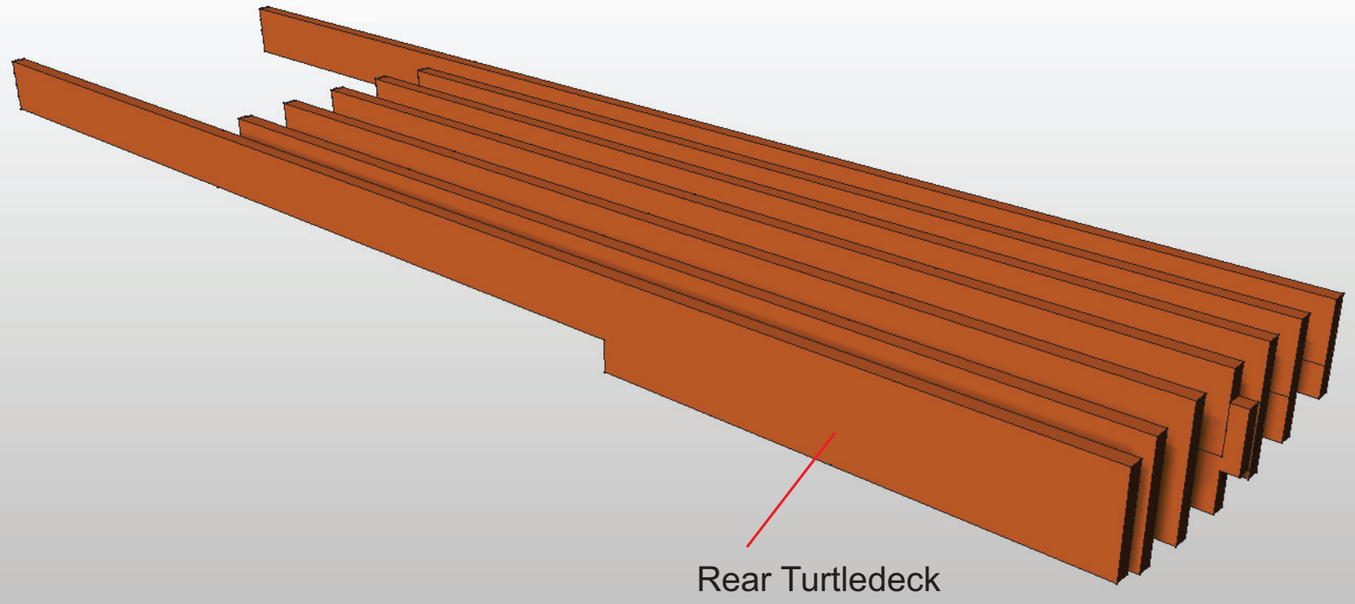
Leave the canards untrimmed and glue in two wing spars in the slots.

## MOVING CANARDS

Trim the canards. Glue an aluminium tube to the body, slide a carbon spar into the tube. Connect a servo horn to the inside end and epoxy the canards to the outboard end.

Use lightweight 5g servos to activate them.

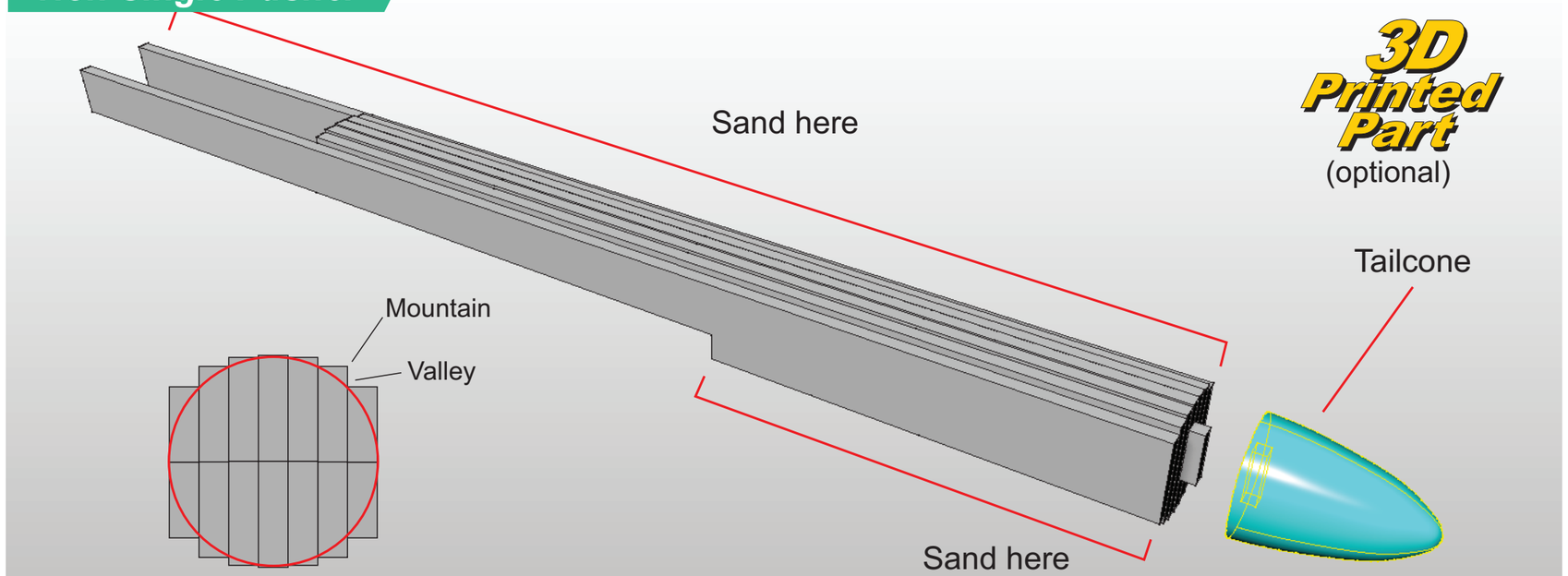
*Non Single Pusher*




Glue together the seven pieces of the **Rear Turtledeck**, shaping the longer outboard pieces as shown.




## Non Single Pusher



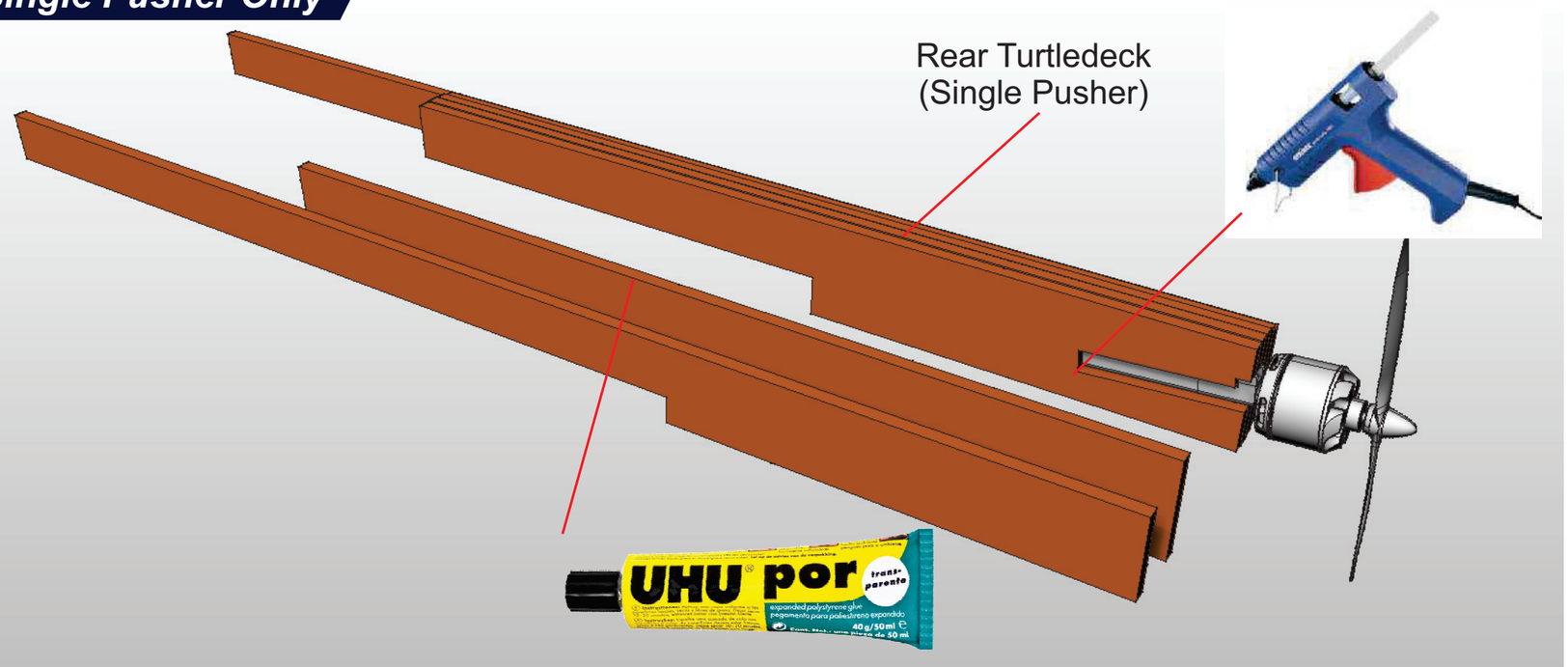

**NOTE : IF YOU ARE CHOOSING TWIN PUSHER - CHOOSE THE TWIN PUSHER TAILCONE PART**

Create either a 3d printed Tailcone or a Tailcone consisting of layers of foam sanded to get the right shape, by removing the ‘mountains’ until the ‘valleys’ are no more.

Glue to the **Rear turtledeck.**

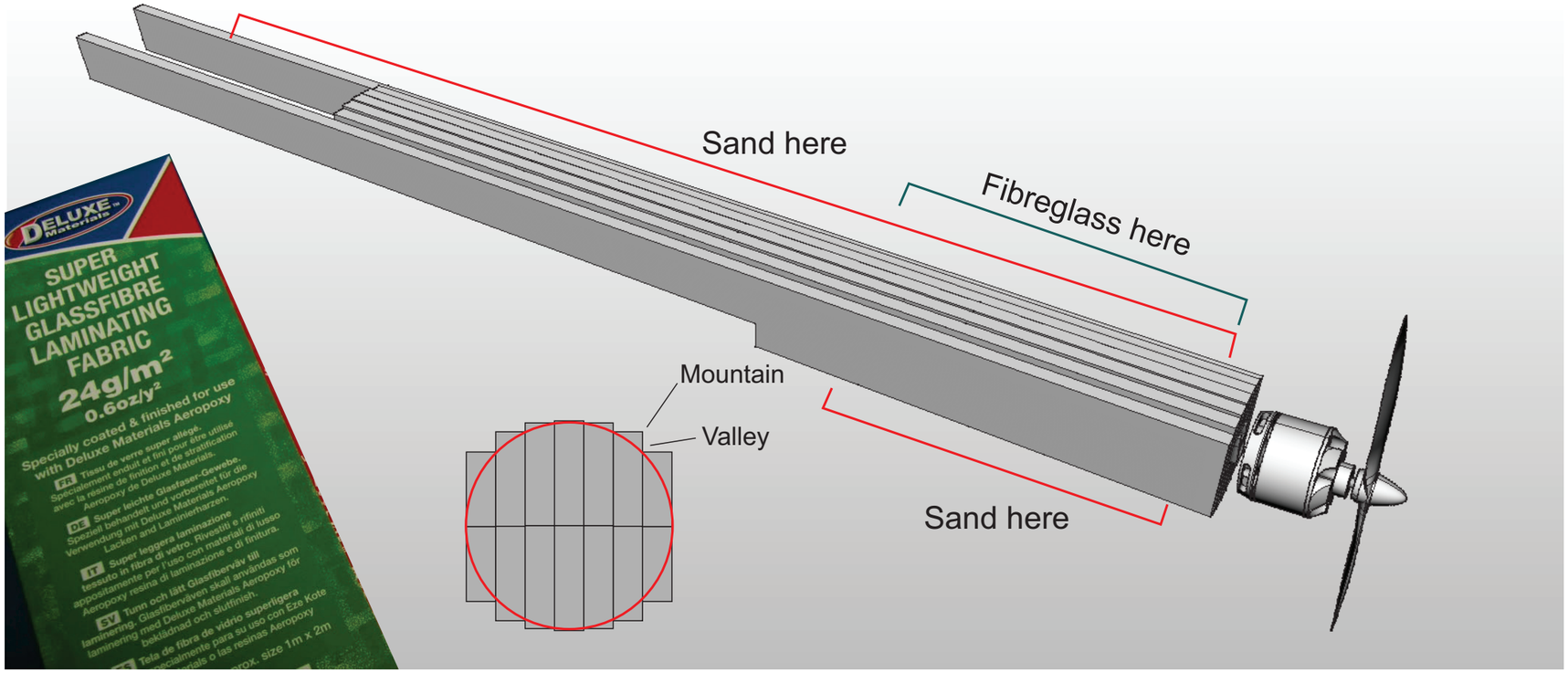
Sand the Turtledeck top and bottom (rear part only) to shape to match the tailcone


## Single Pusher Only




Glue together the middle three pieces of the **Rear Turtledeck (Single Pusher).**

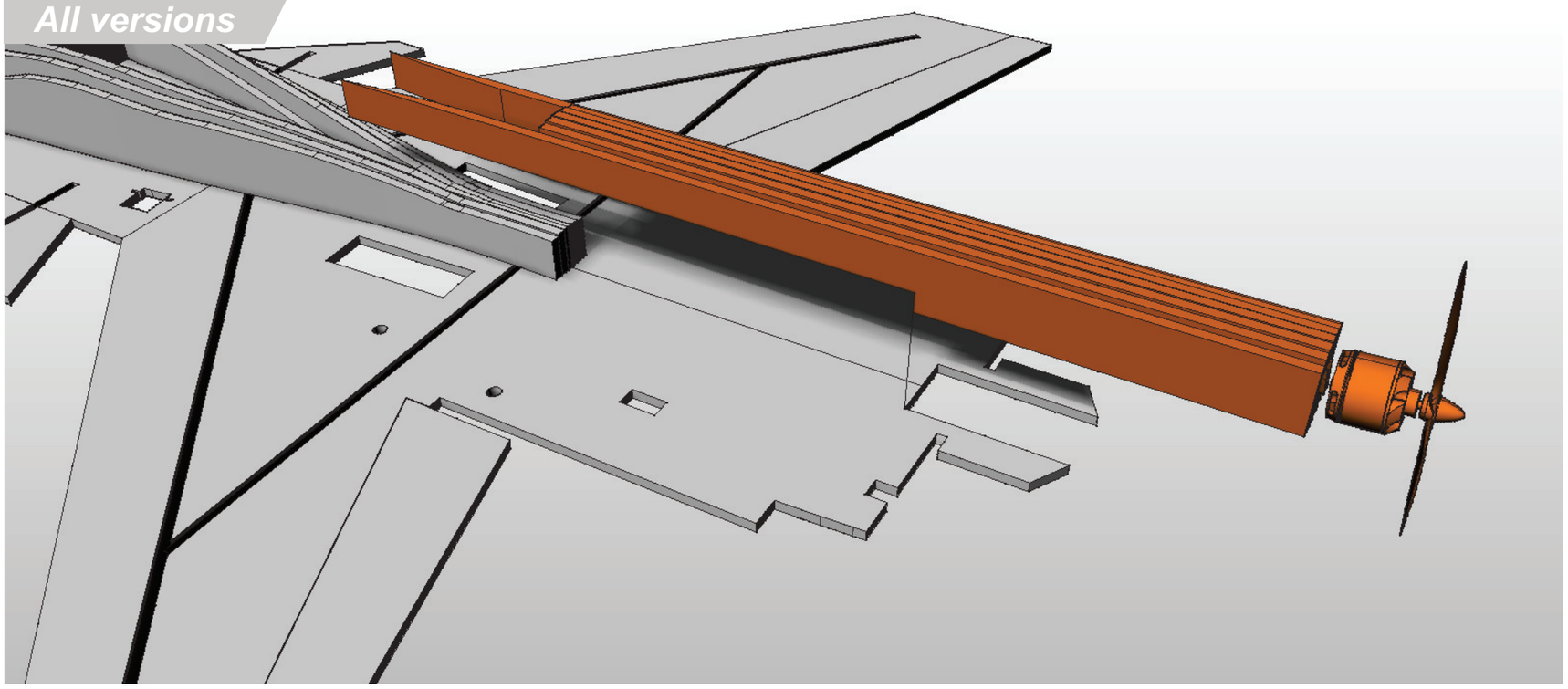
Using Hot melt glue, attach the motor mount stick mount as shown.




Attatch the remaining pieces of the **Rear Turtledeck (Single Pusher**) Sand the Turtledeck top and bottom (rear part only) to shape.

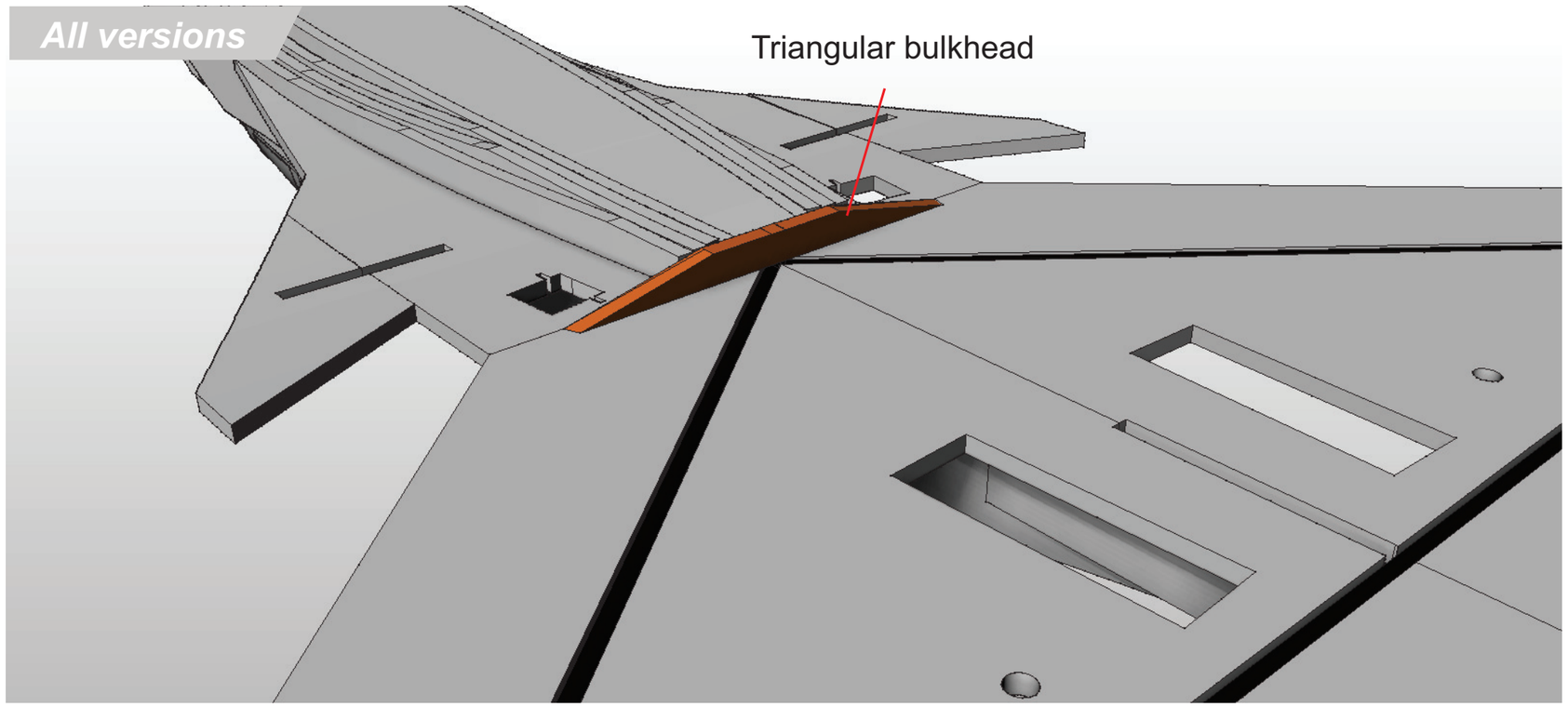
Wrap the rear part of the Turtledeck with 0.6oz Fibreglass and Water Based Polyurethane varnish as resin.


*All versions*



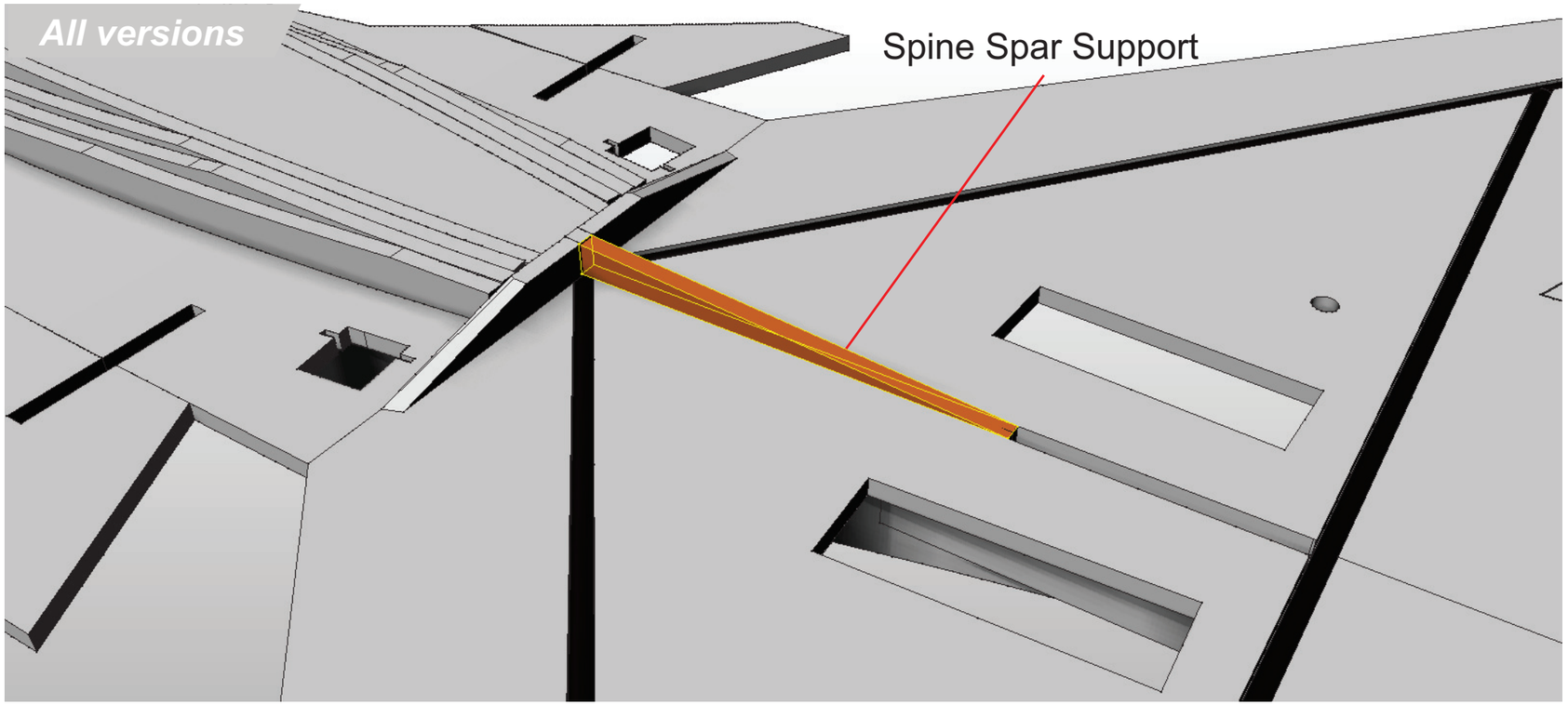
Glue the **Rear Turtledeck**, to the assembly.

*All versions*




Glue the **Triangular bulkhead** in place as shown.

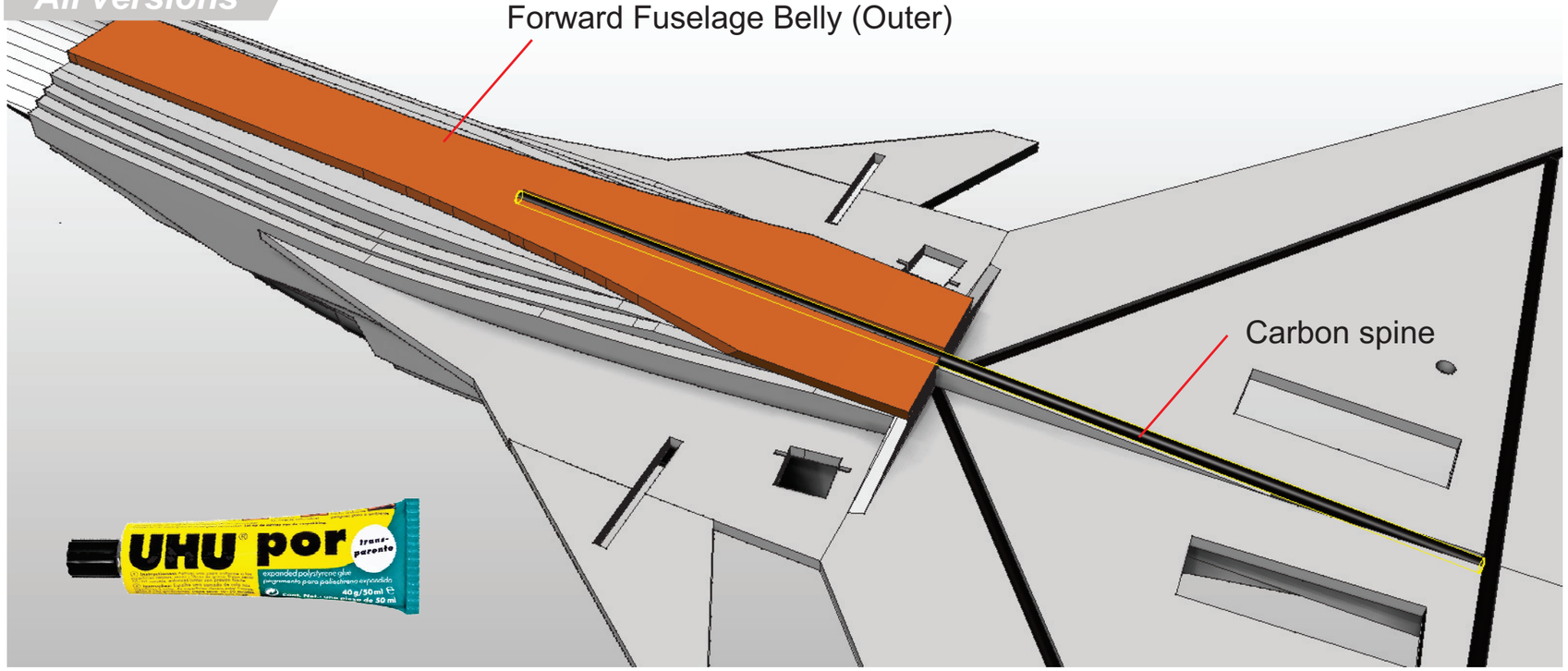

*All versions*




Glue the **Spine Spar Support** to the assembly.

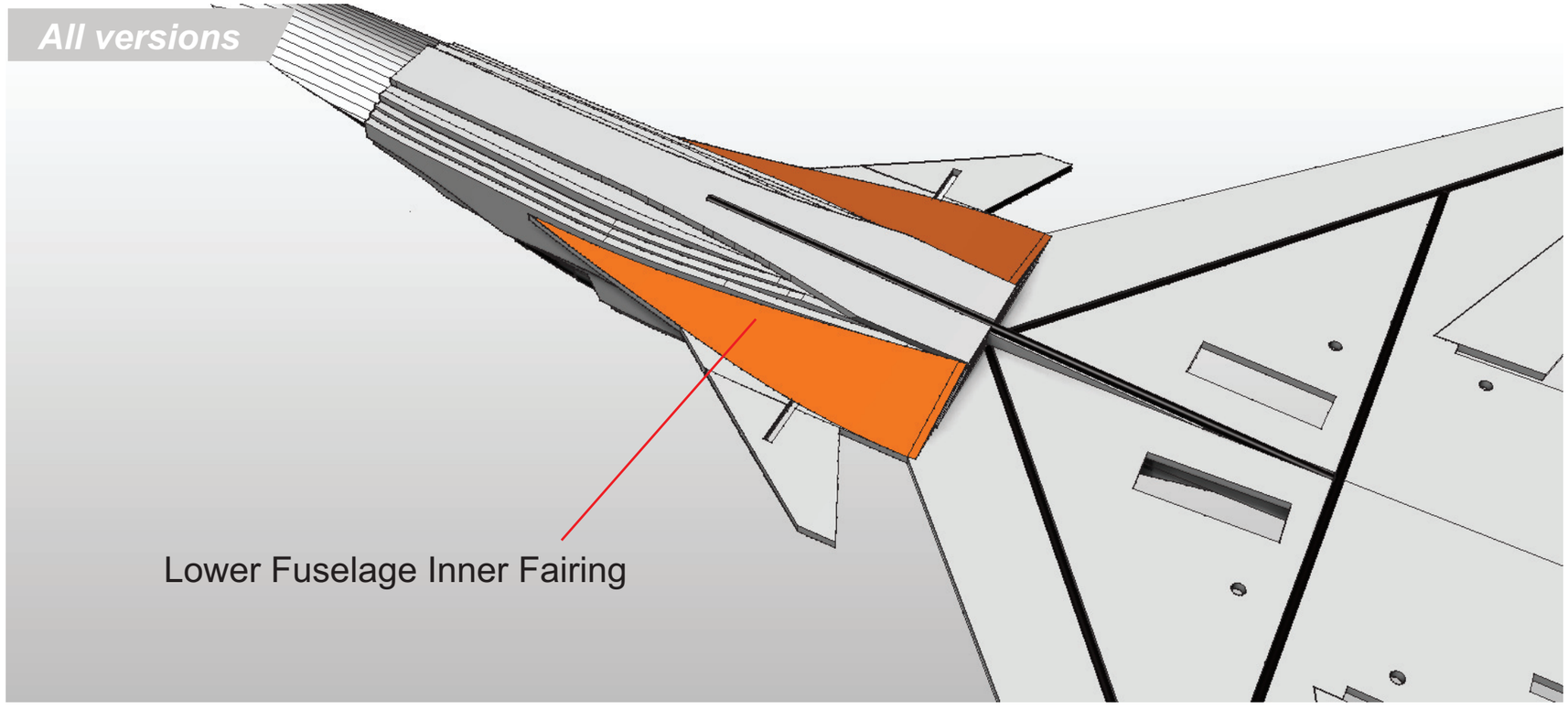



*All versions*




Glue the**Forward Fuselage Belly (Outer**) to the assembly using UHU POR, then Epoxy the **Carbon spine** in place as shown.

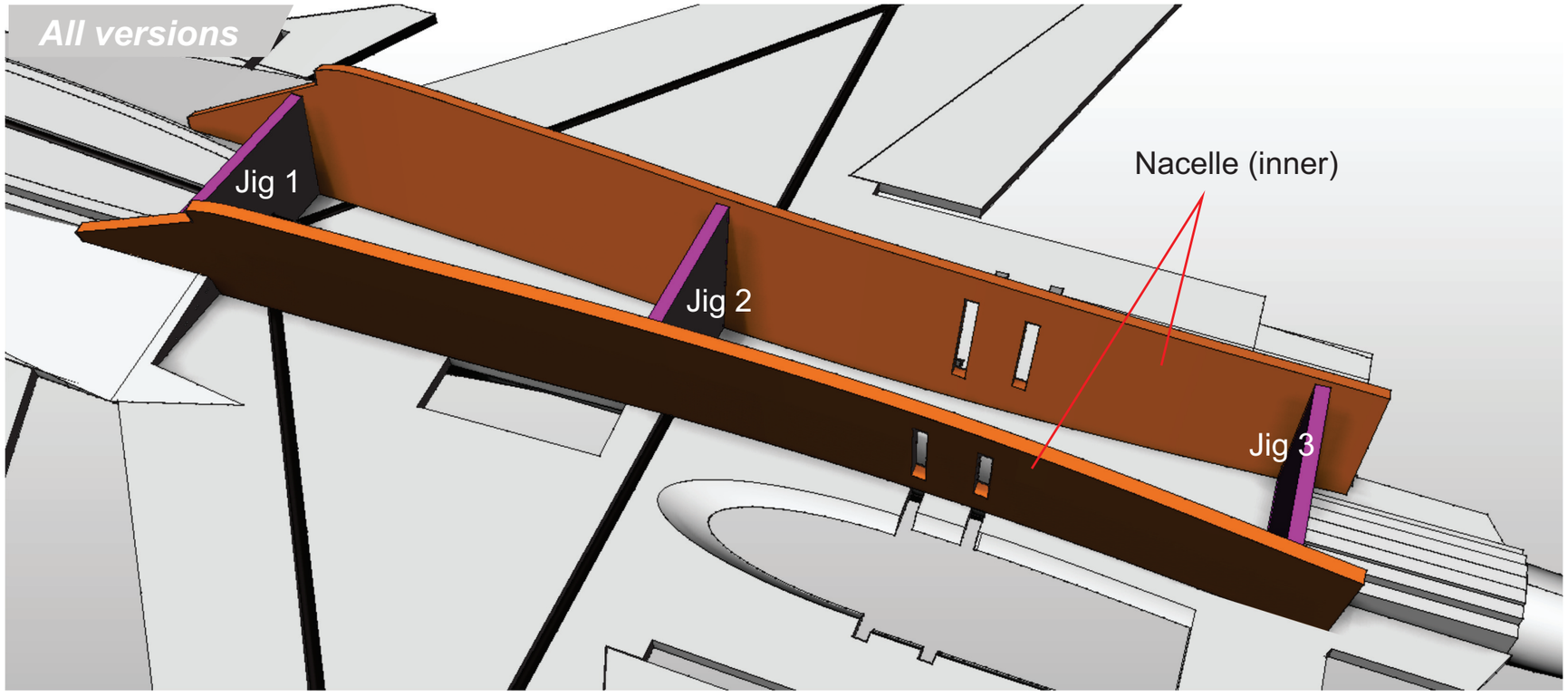
*All versions*




Glue the **Lower Fuselage Inner Fairings** to the assembly. If you are using servos to operate the canards, check for clearance and remove obstructing foam if necessary.

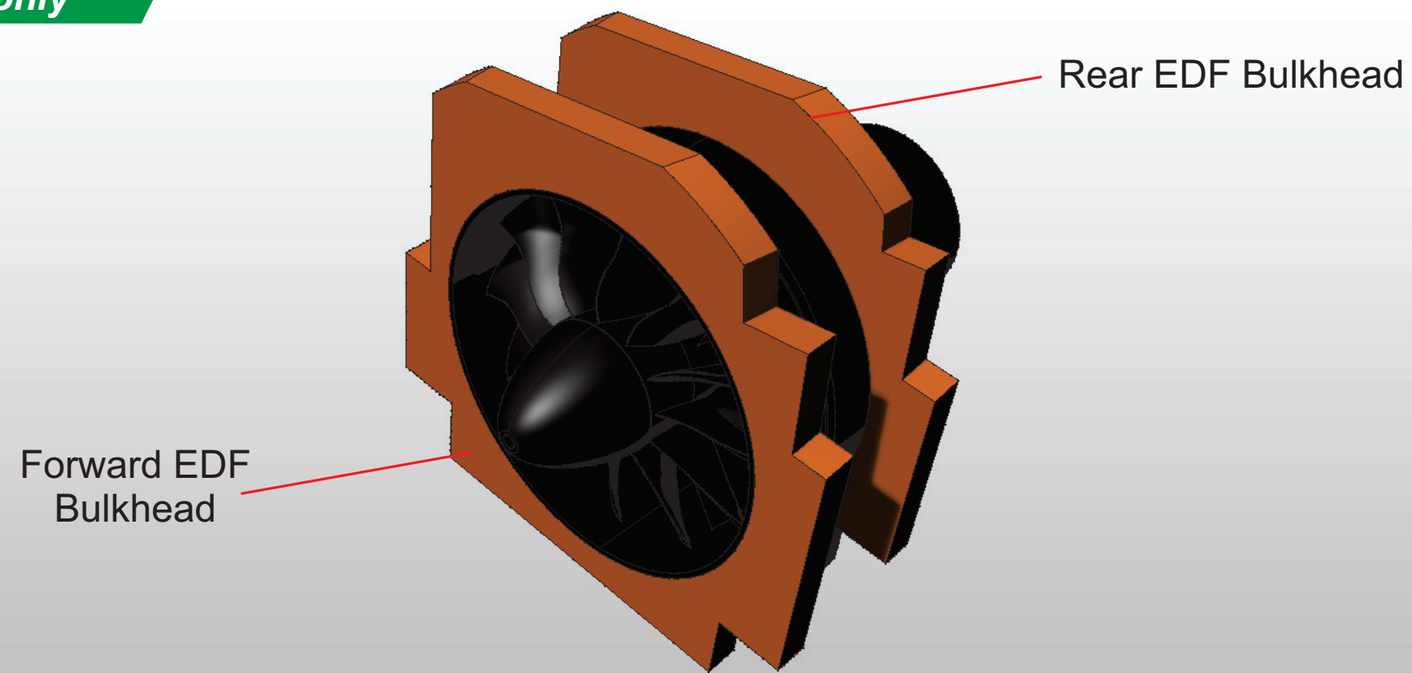


*All versions*




Using the pre-marked guidelines and the three Jigs, Glue the **Nacelle (Inners)** in place as shown.

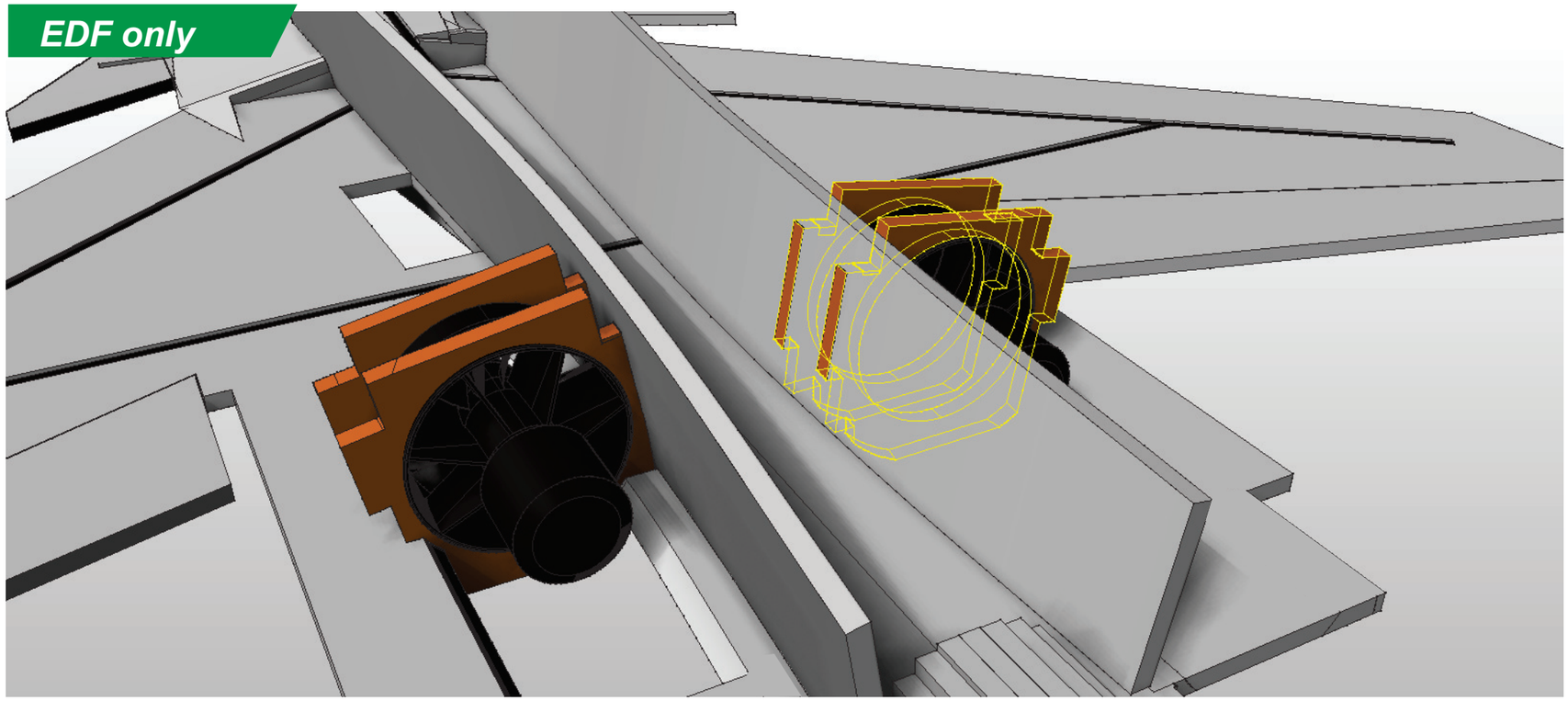

*EDF only*




Adjust the size of your **EDF Bulkheads** to suit your chosen EDF. Do not glue at this stage.

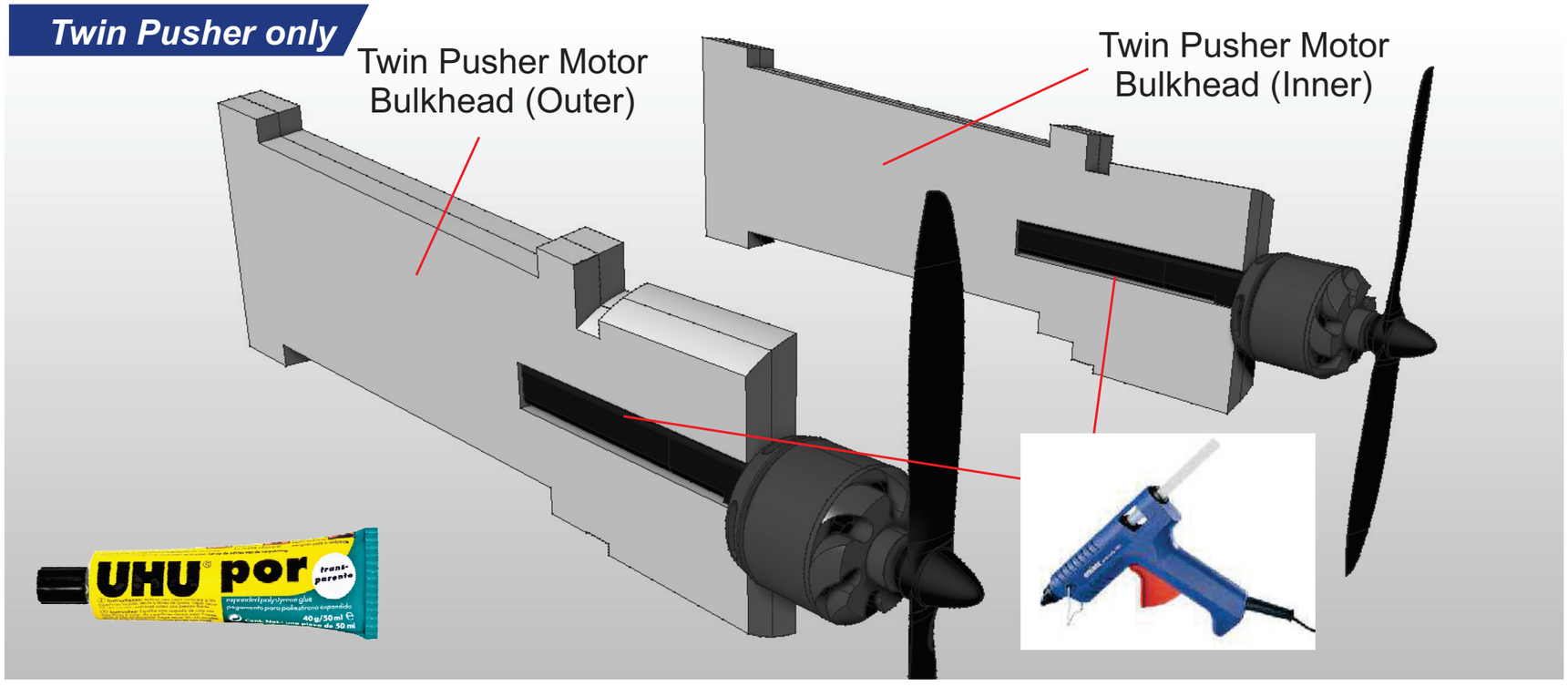


**EDF only**



Glue the **EDF Bulkheads** into the fuselage.


**Twin Pusher only**

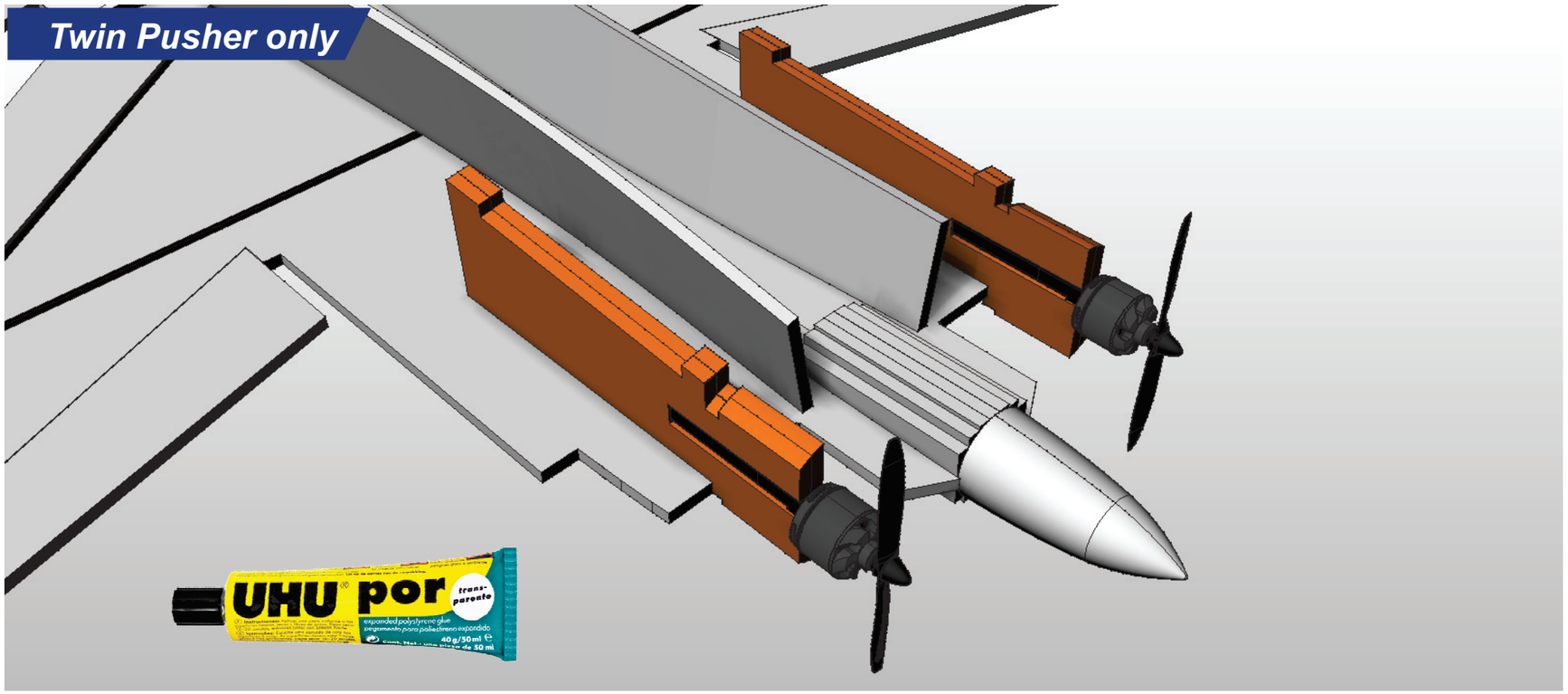



Glue the two parts of the **Twin Push Motor Bulkheads** together using UHU Por and make a mirrored pair.

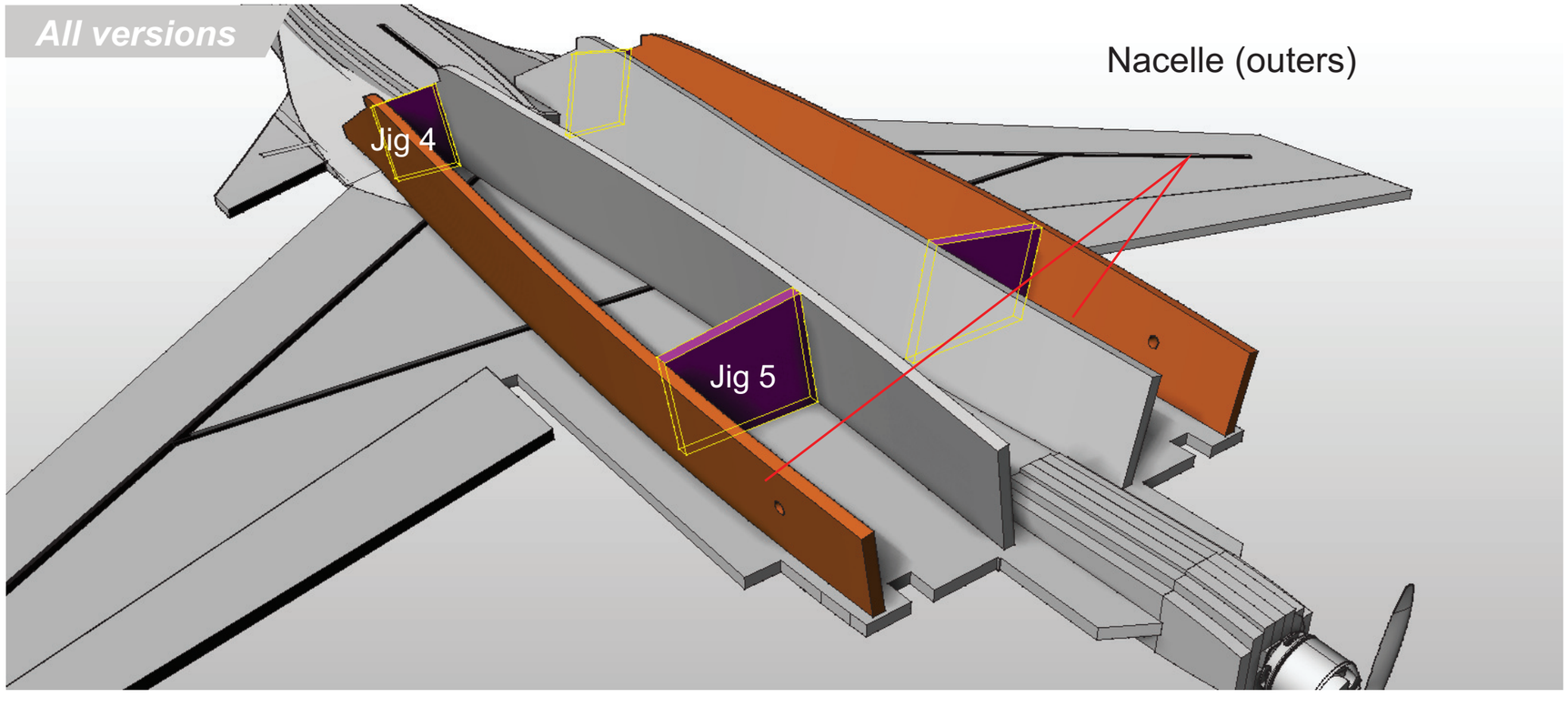
CHOOSE to fit 3D printed single axis Thrust vectoring mounts or fixed mounts.

Using Hot melt glue, stick the motor mount brackets into the slots as shown



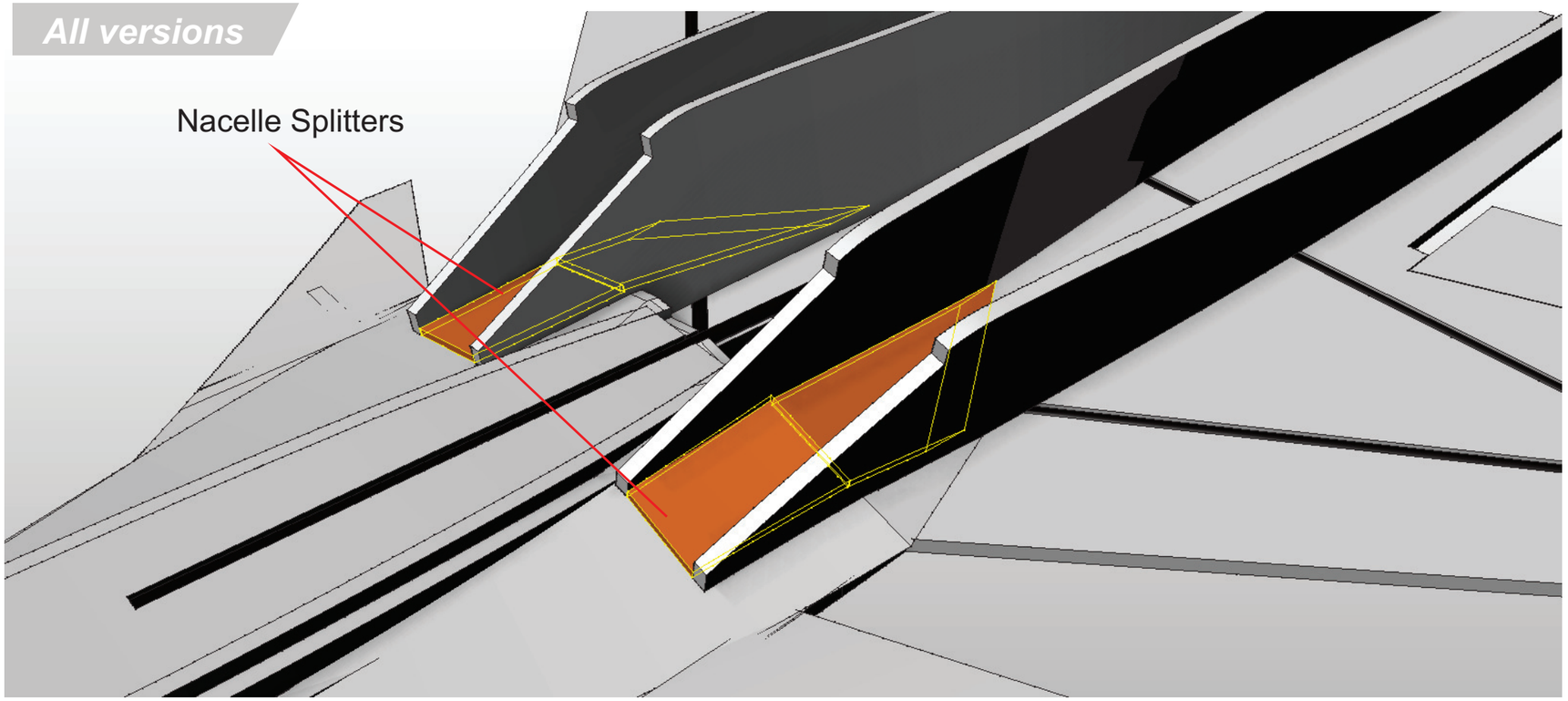



Glue the Pusher assemblies into the fuselage.



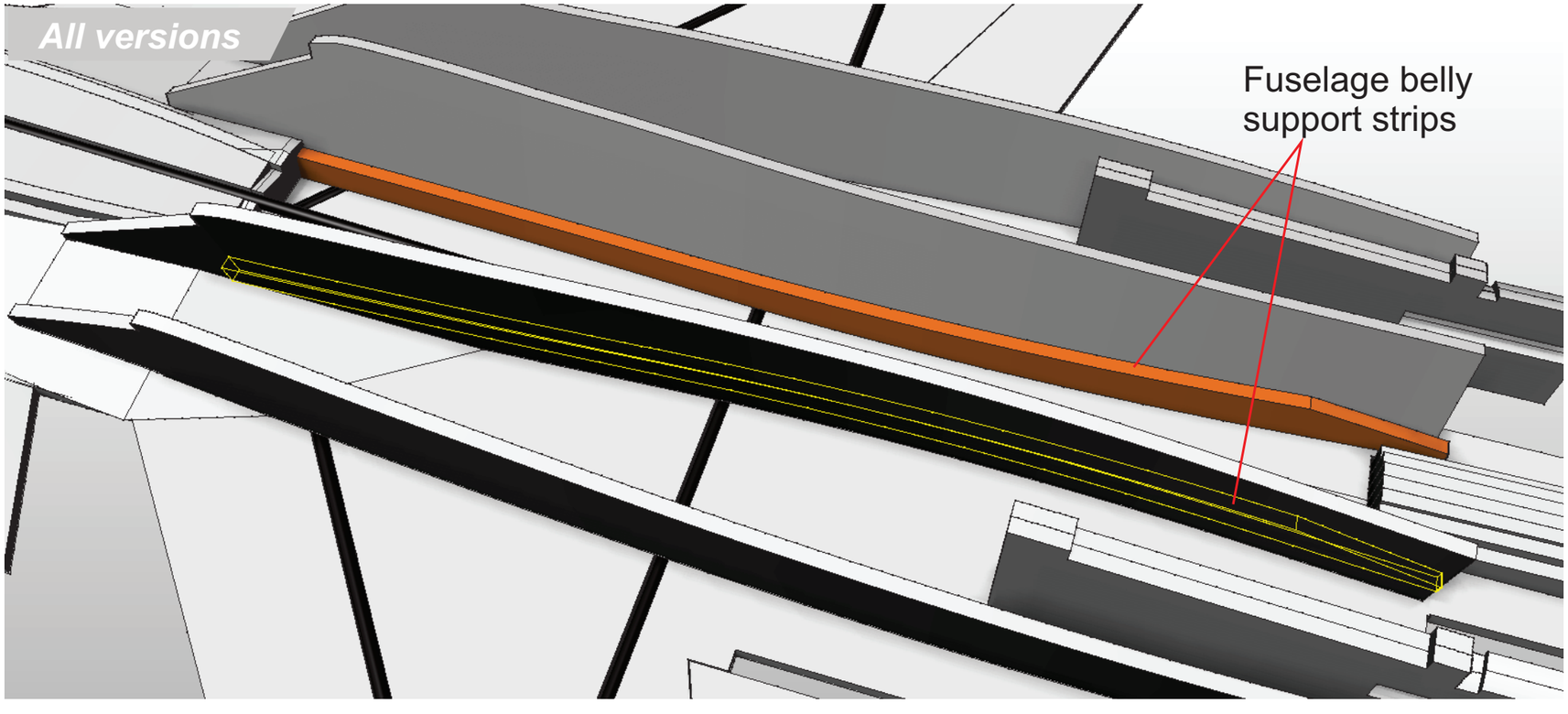

Using the Jigs and the pre-marked lines, glue the **Nacelle (Outers)** onto the assembly.

*All versions*




Crush bend and Glue the **Nacelle Splitters** in place as shown.

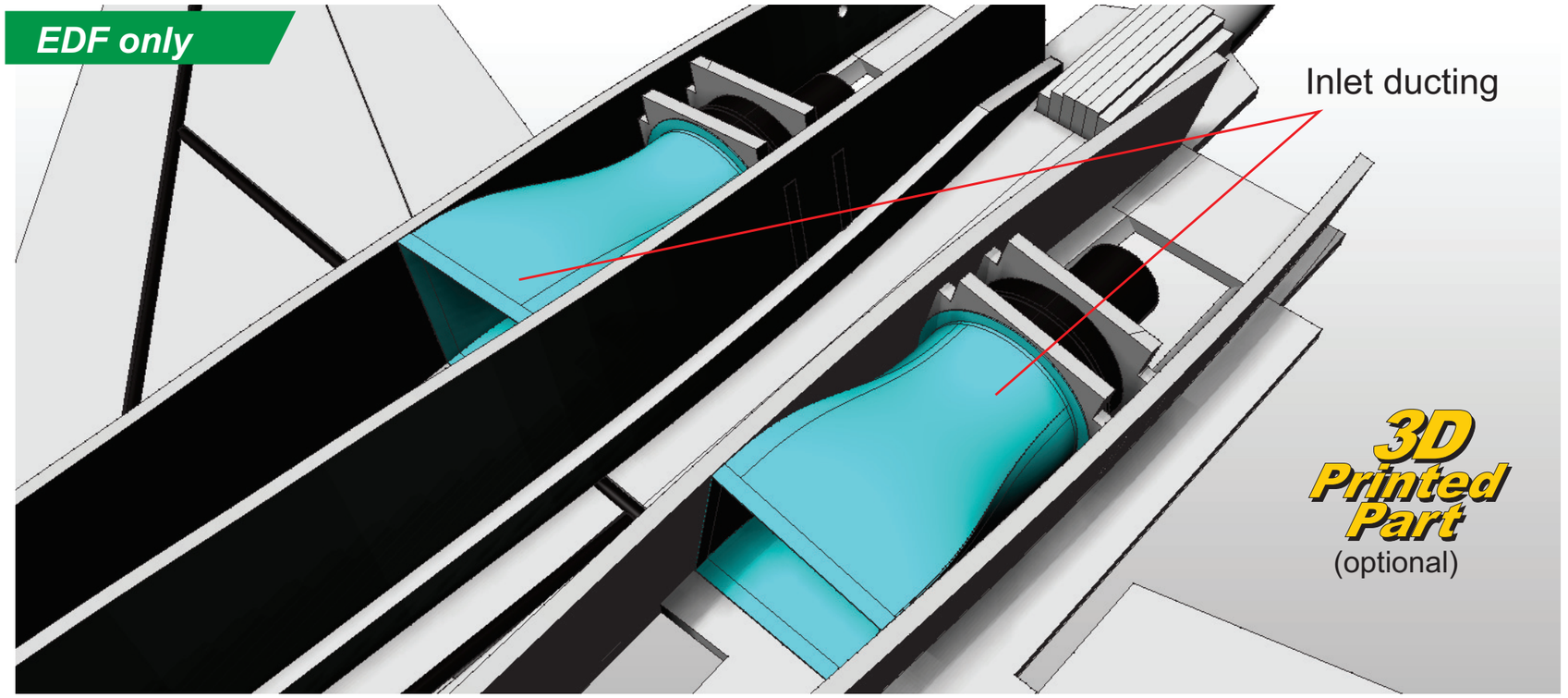

*All versions*




Glue the **Fuselage belly support strips** in place.




**EDF only**




Glue the EDF units in place and <u>run the motor wires upwards.</u>

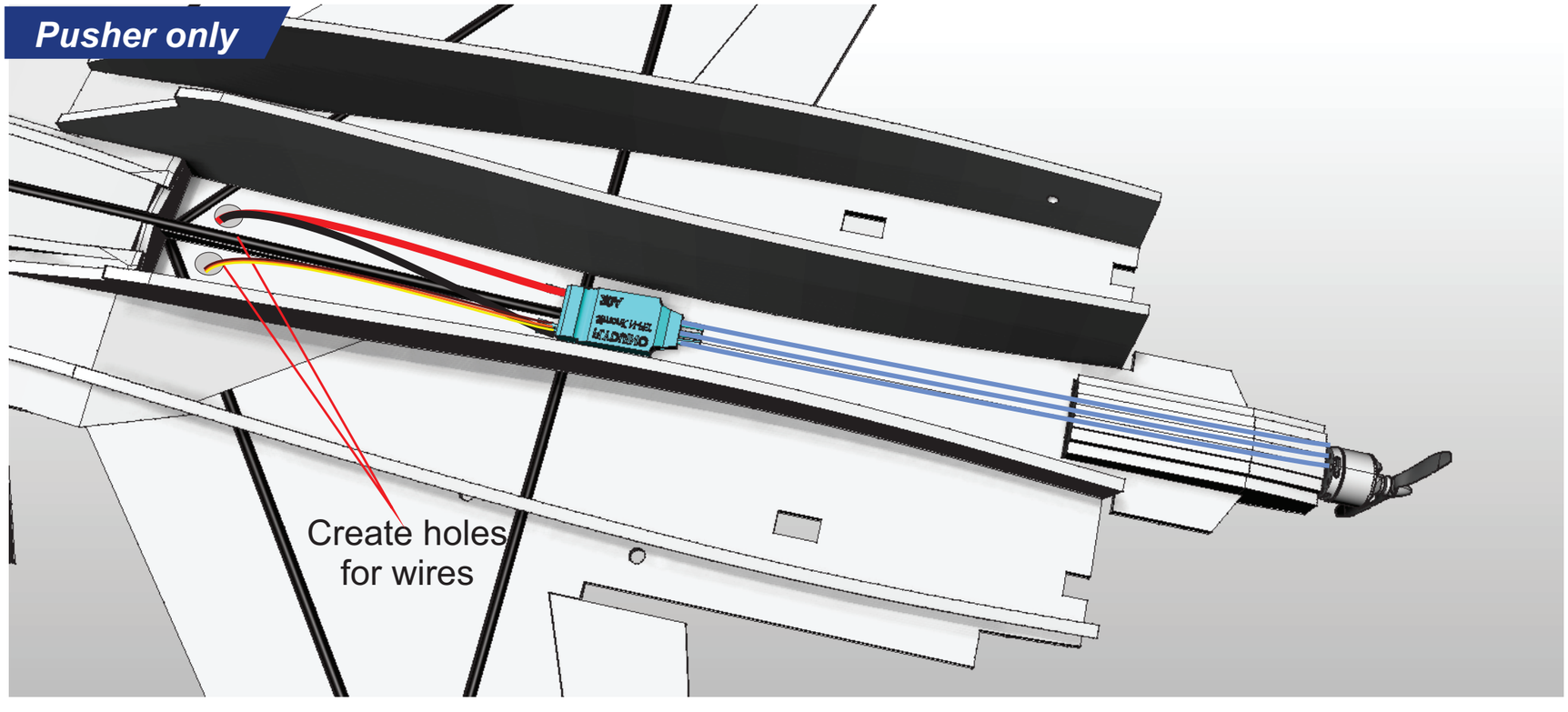
Choose either :-

1. Leave EDF inlet ring on and

2. Using 3mm depron, create inlet ducting to create a smooth airflow into the EDF.

3. 3D print the inlet ducting as shown here.


**Pusher only**

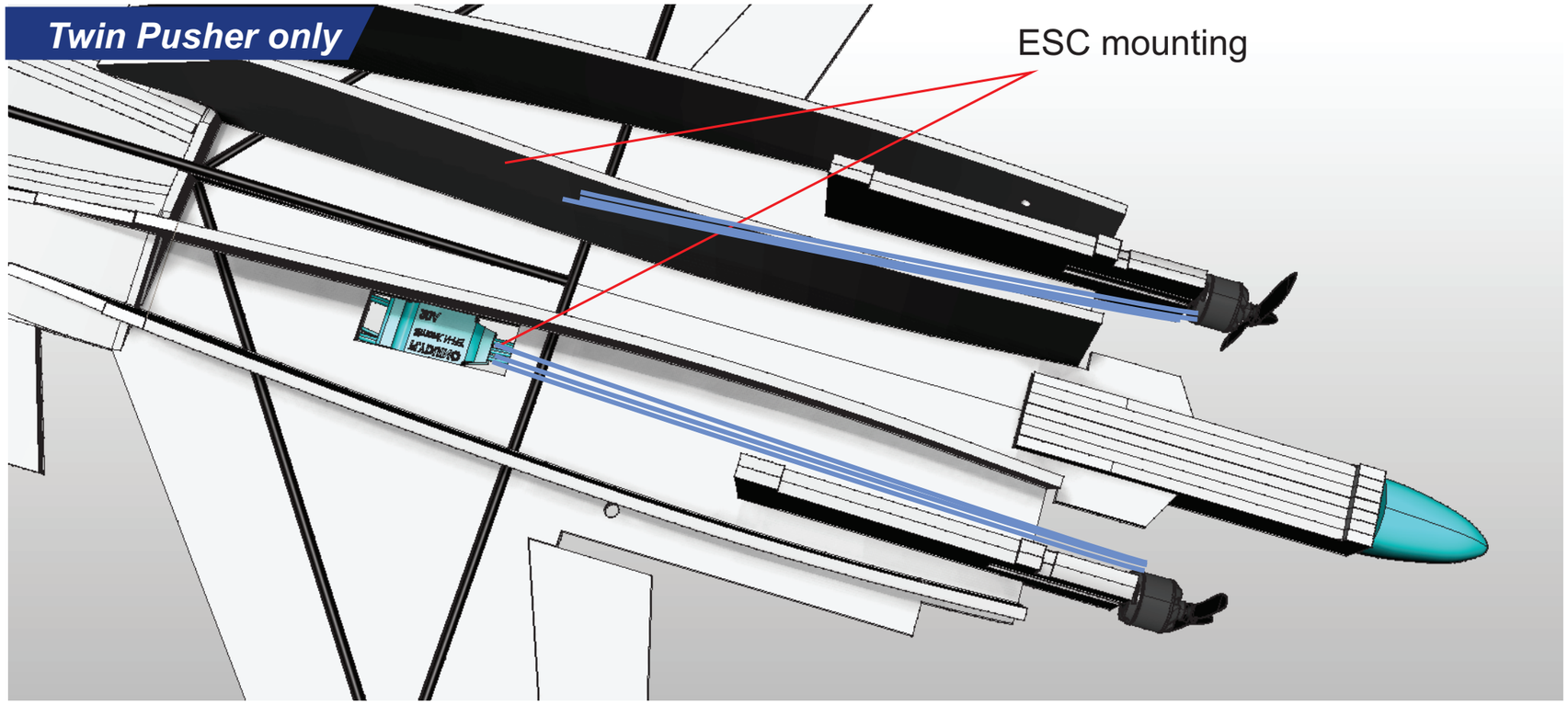



Connect the motor wires to the ESC - extending where necessary.

Glue the ESC in place using Hot melt glue

Make some holes and run the Battery and RX cable through the **Wing** as shown.

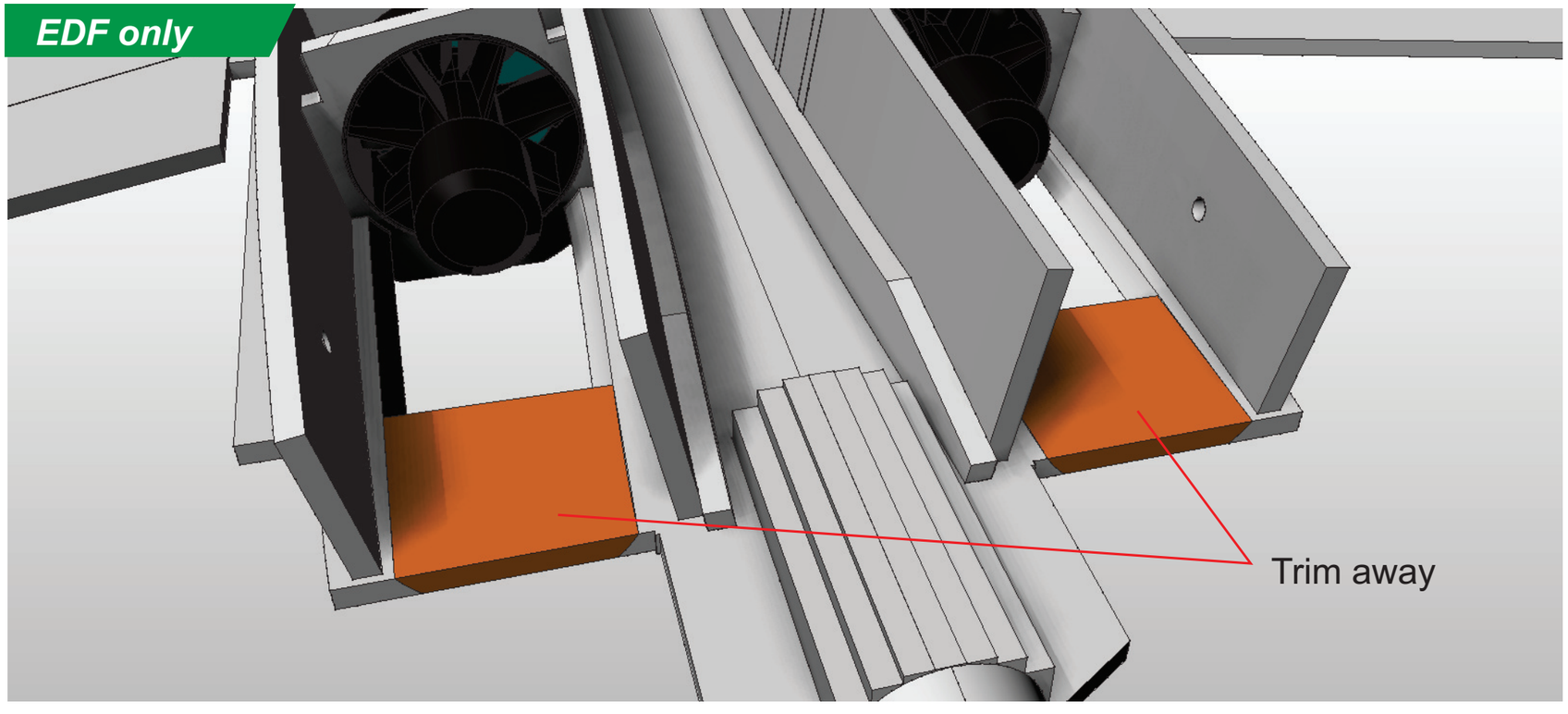




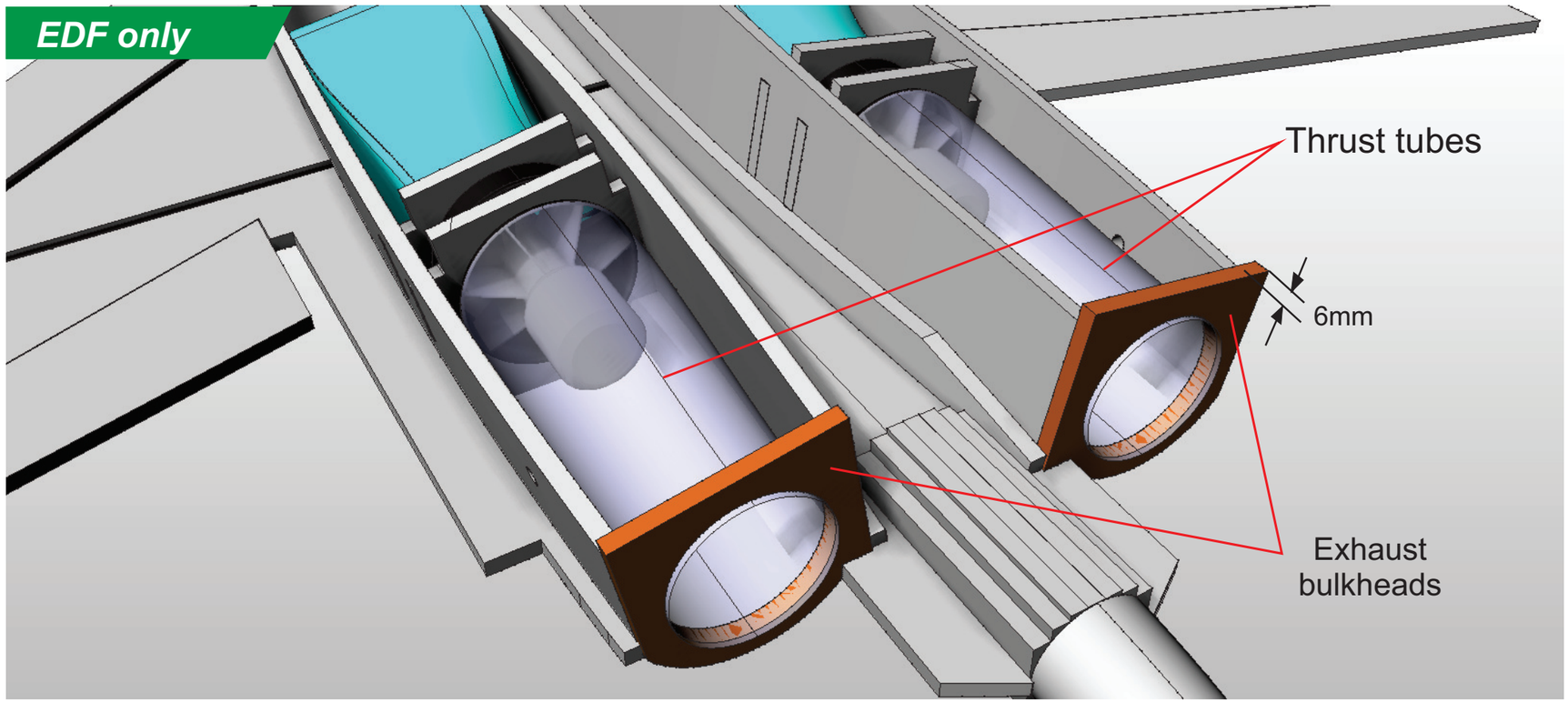

Connect the motor wires to the ESC's - extending where necessary.

Glue the ESC into the holes using Hot melt glue along the edges of the ESC.

Run the Battery and RX cable through the **Wing** ESC hole to the top side.



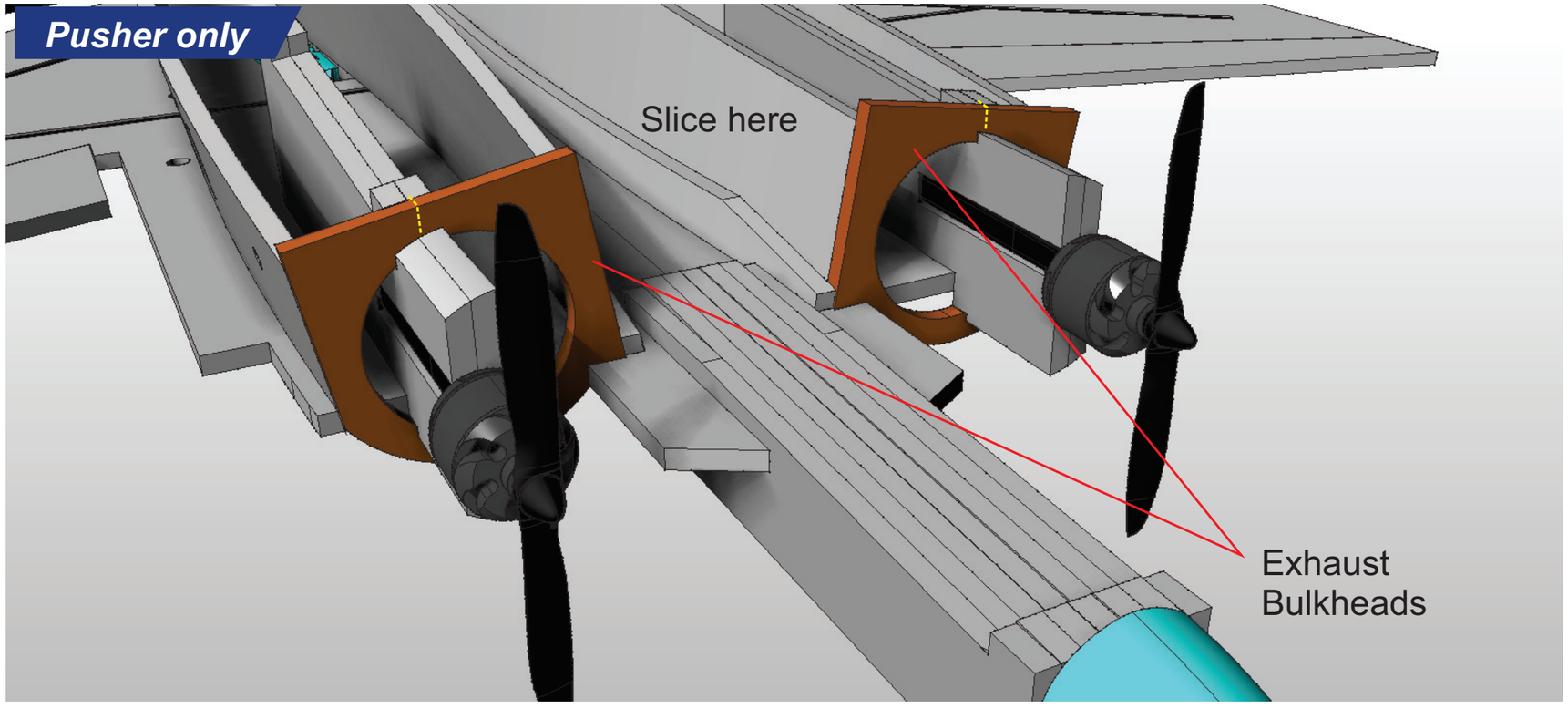

Trim away the holding tabs as shown.




Create the **thrust tubes** using 350 micron plastic sheet. Tape together using nylon reinforced tape.

Use scrap blocks of foam to help to attach to the rear exhaust bulkhead.

Glue the **Thrust tubes** and **Exhaust Bulkheads** in place.

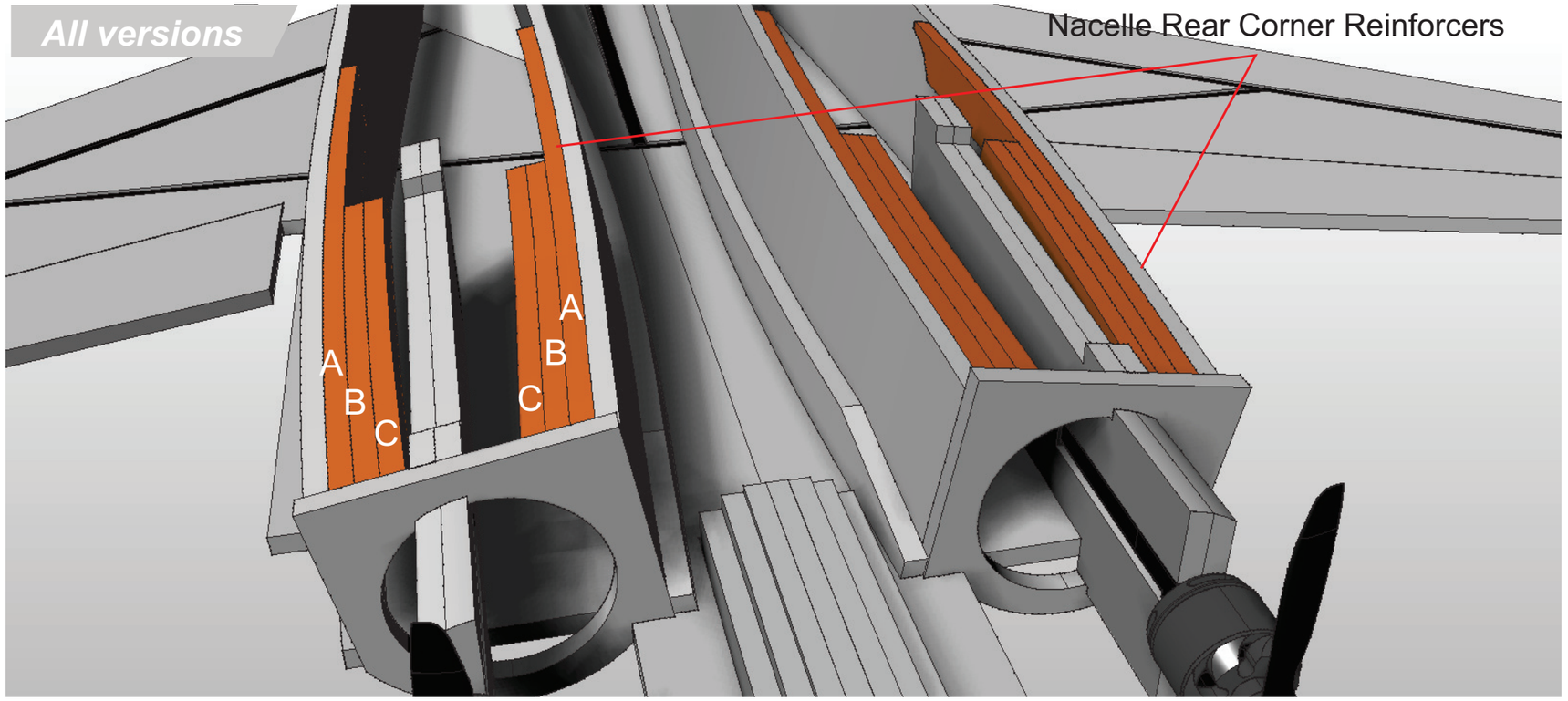

Single Pusher :

Attach **Exhaust Bulkheads.**

Twin Pusher :

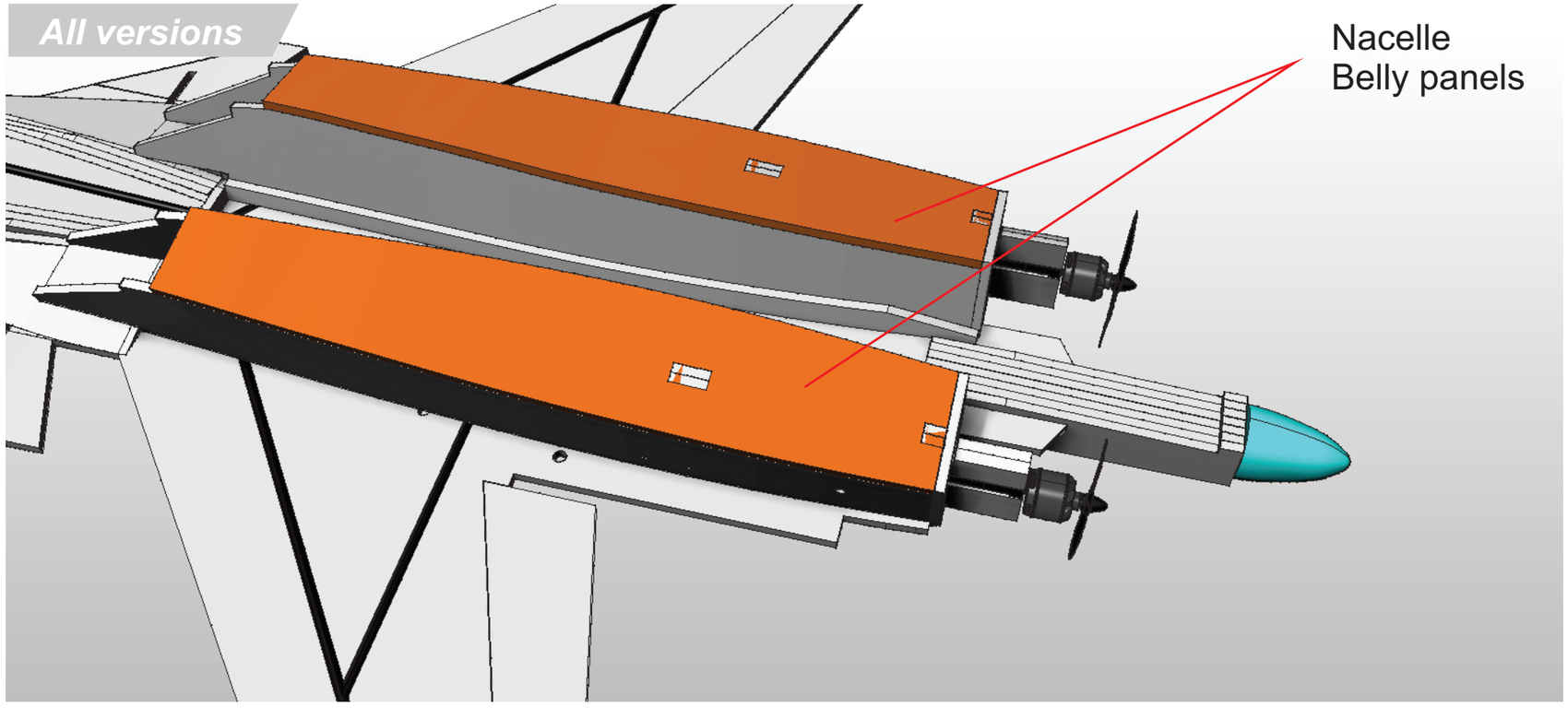
Slice through the **Exhaust Bulkhead** in order to fix it around the motor mount, then glue in place.

*All versions*




Glue the **Nacelle Rear Corner Reinforcers** together (A + B + C) then glue to the assembly as shown.

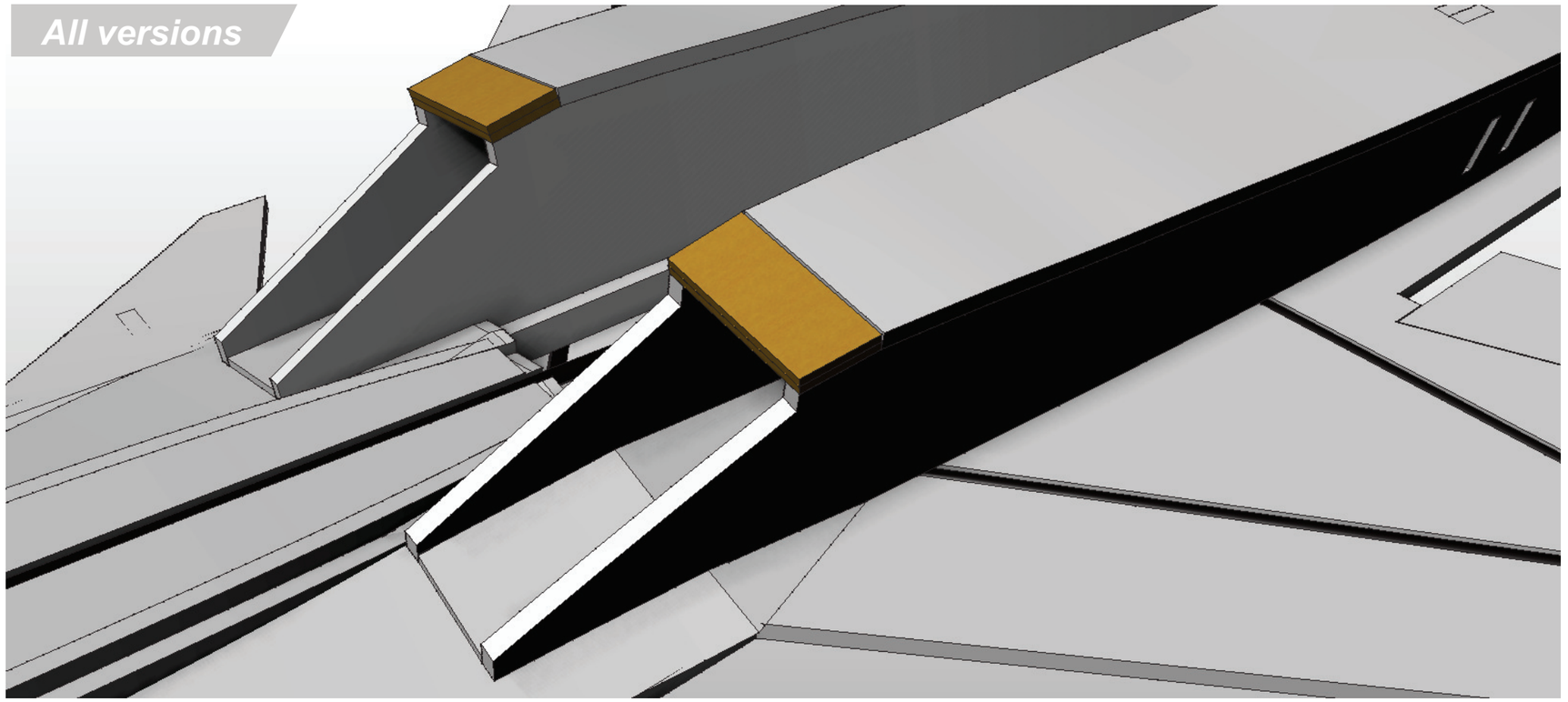

*All versions*




Glue the **Nacelle Belly Panels** in place.

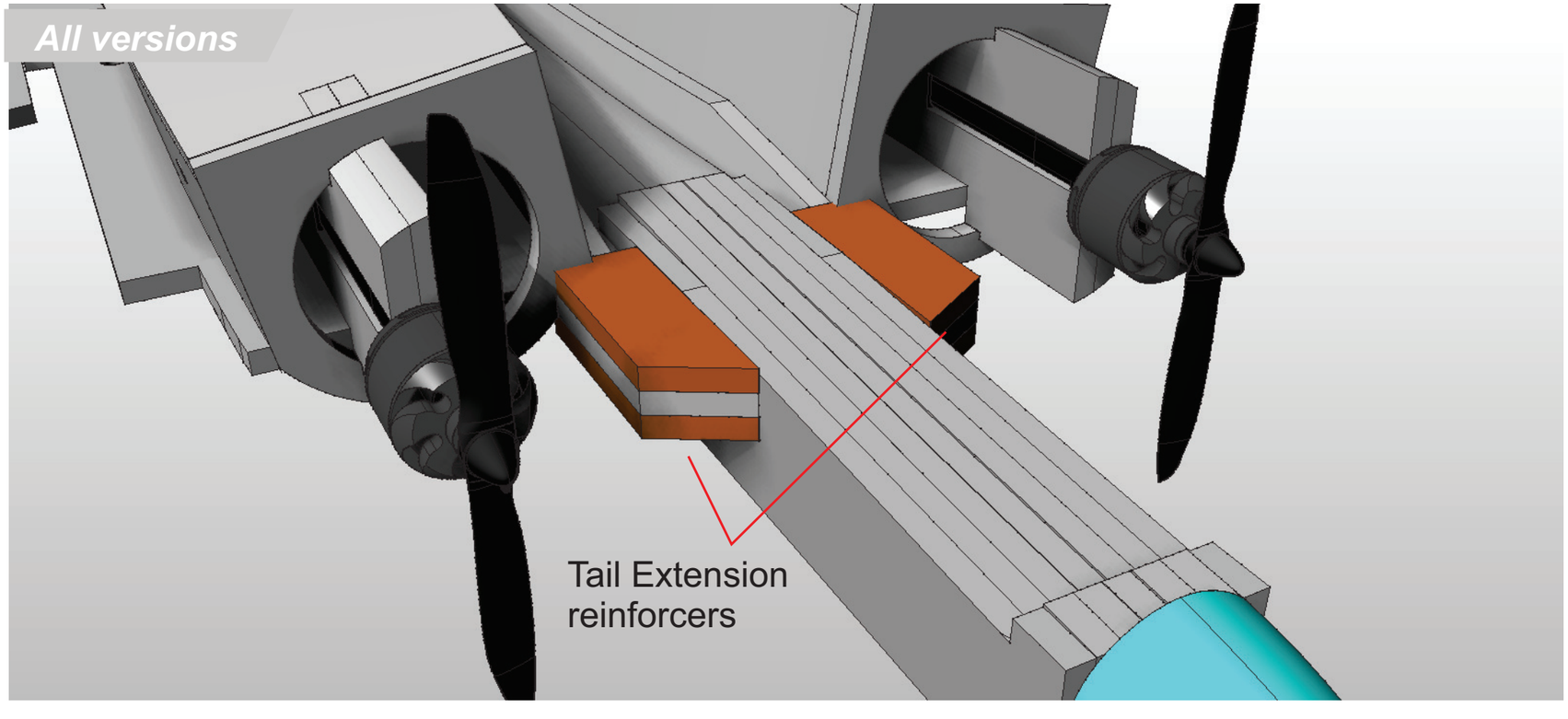



*All versions*



Glue the four pieces of the 3mm Lite-ply Intake protectors to the assembly.

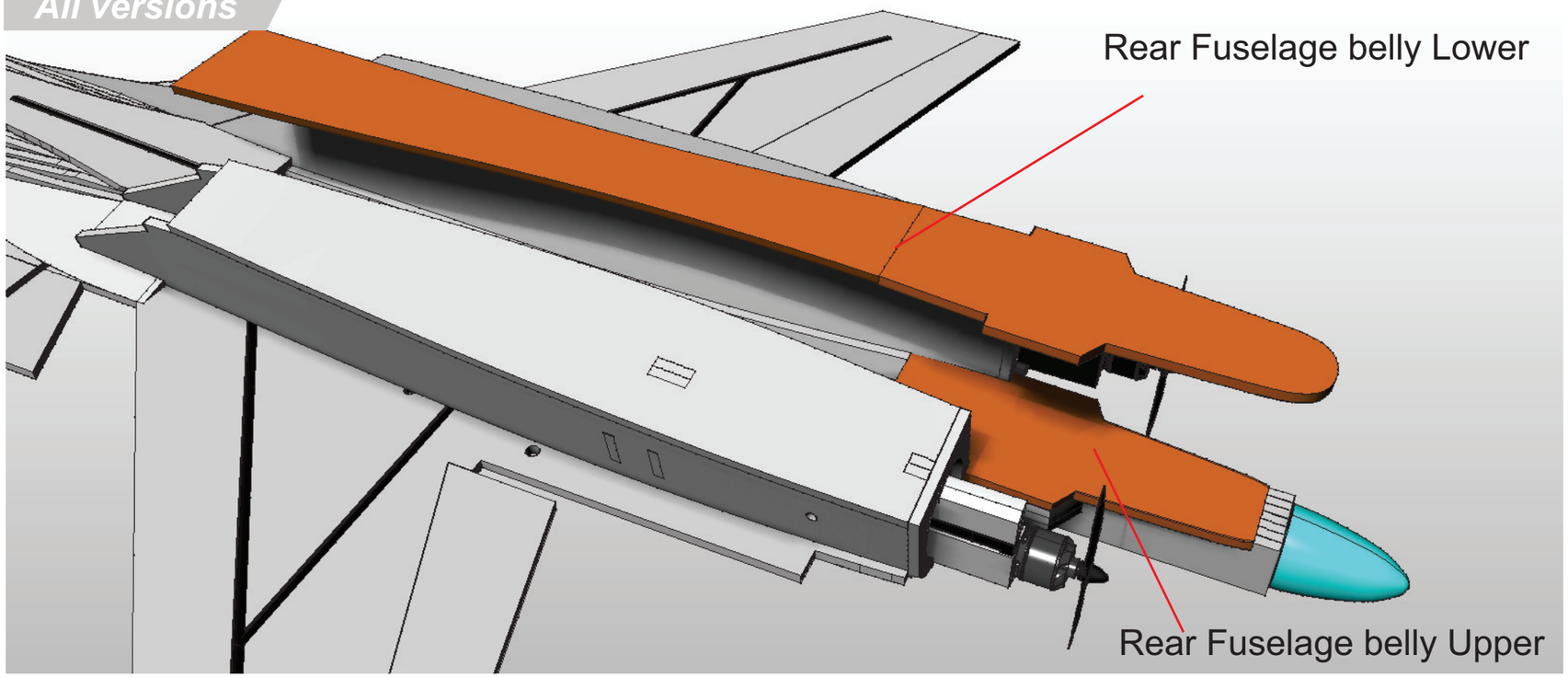

*All versions*




Glue the **Tail extenstion reinforcers** in place.

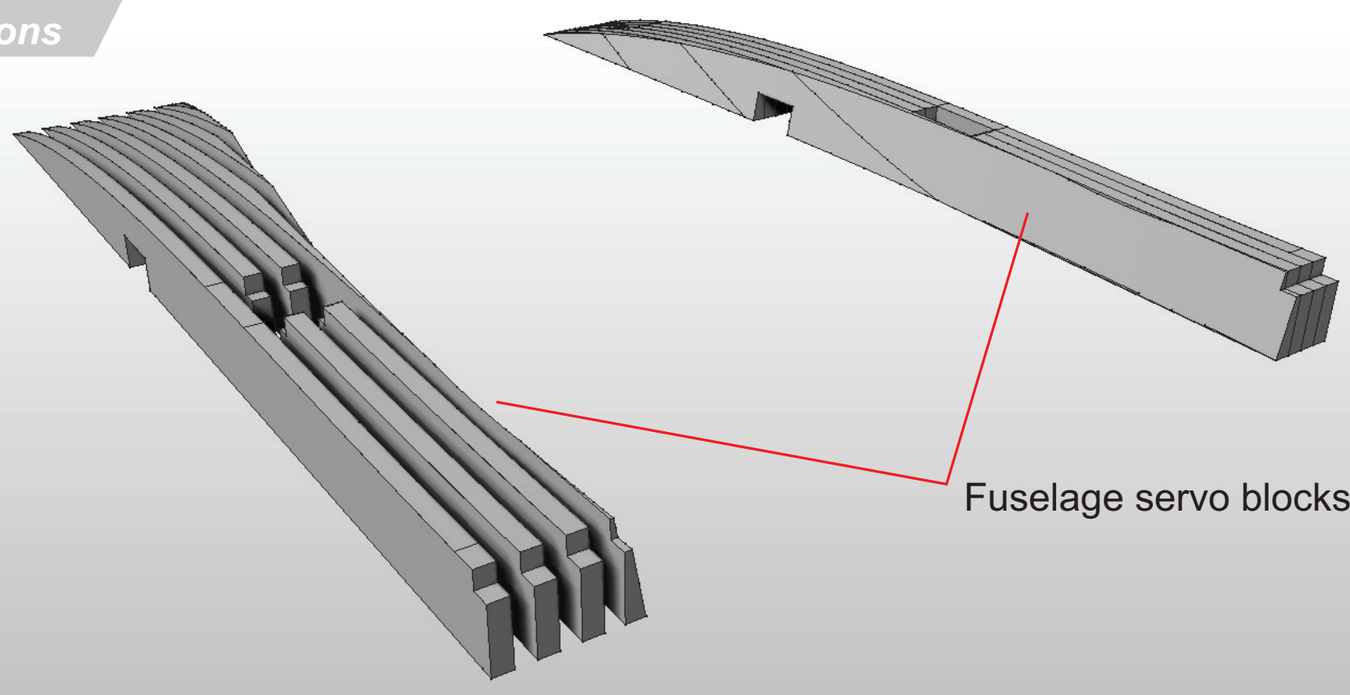



*All versions*




Fit the **Rear Fuselage Belly Lower** and **Upper** versions to fit the assembly. Glue in place

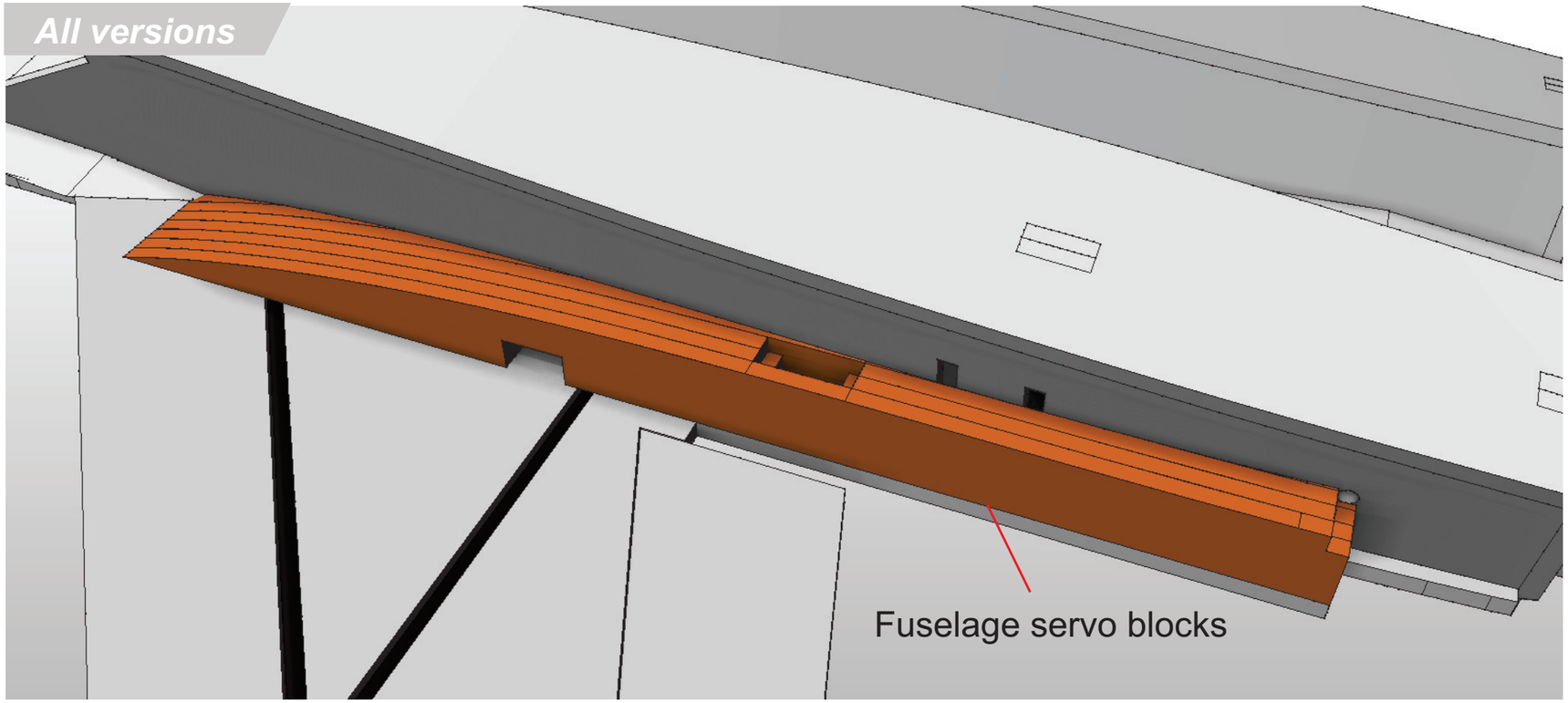

*All versions*




Laminate the two mirrored **Fuselage Servo Blocks** and carefully sand to shape to match the angle of the **Nacelle side (outer)**

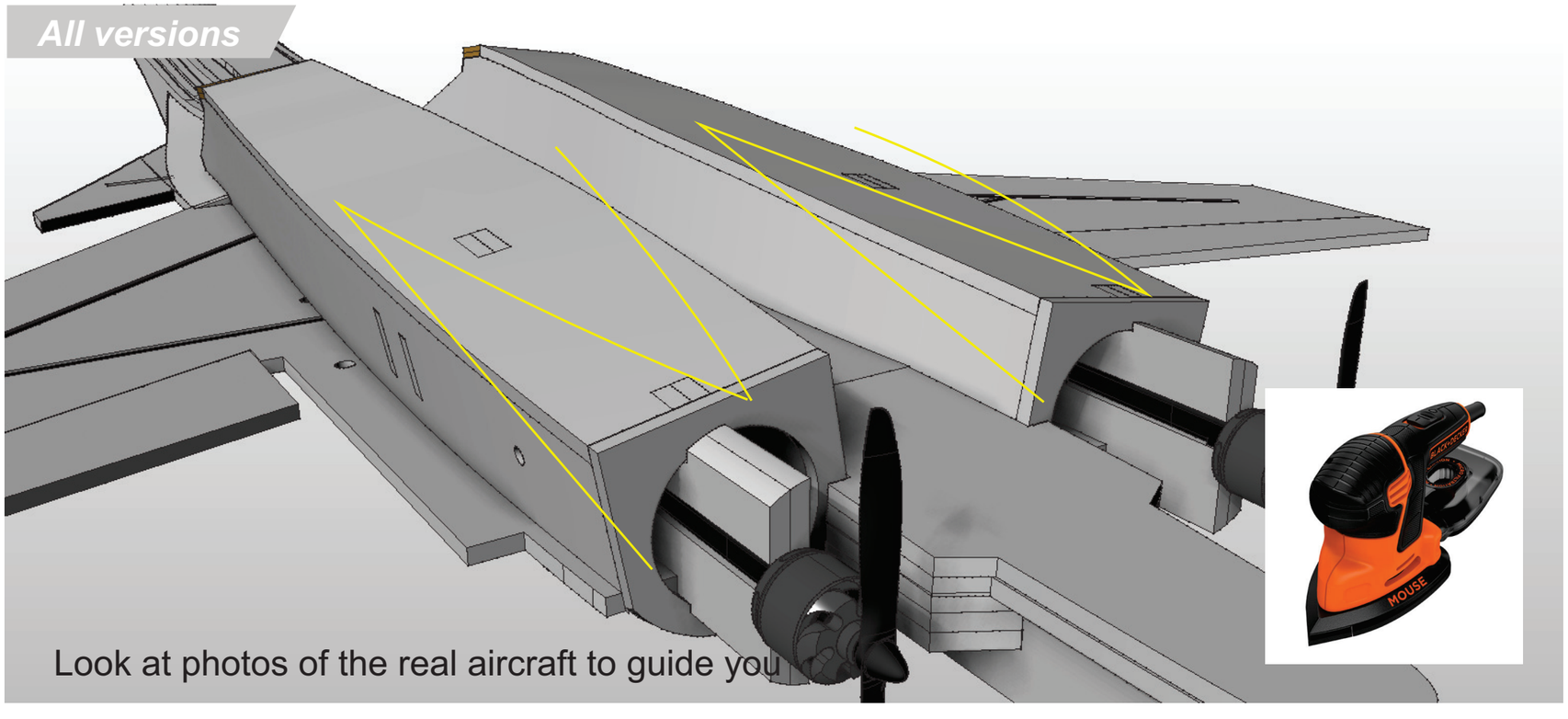



*All versions*




Glue the **Fuselage Servo Blocks** in place.


*All versions*



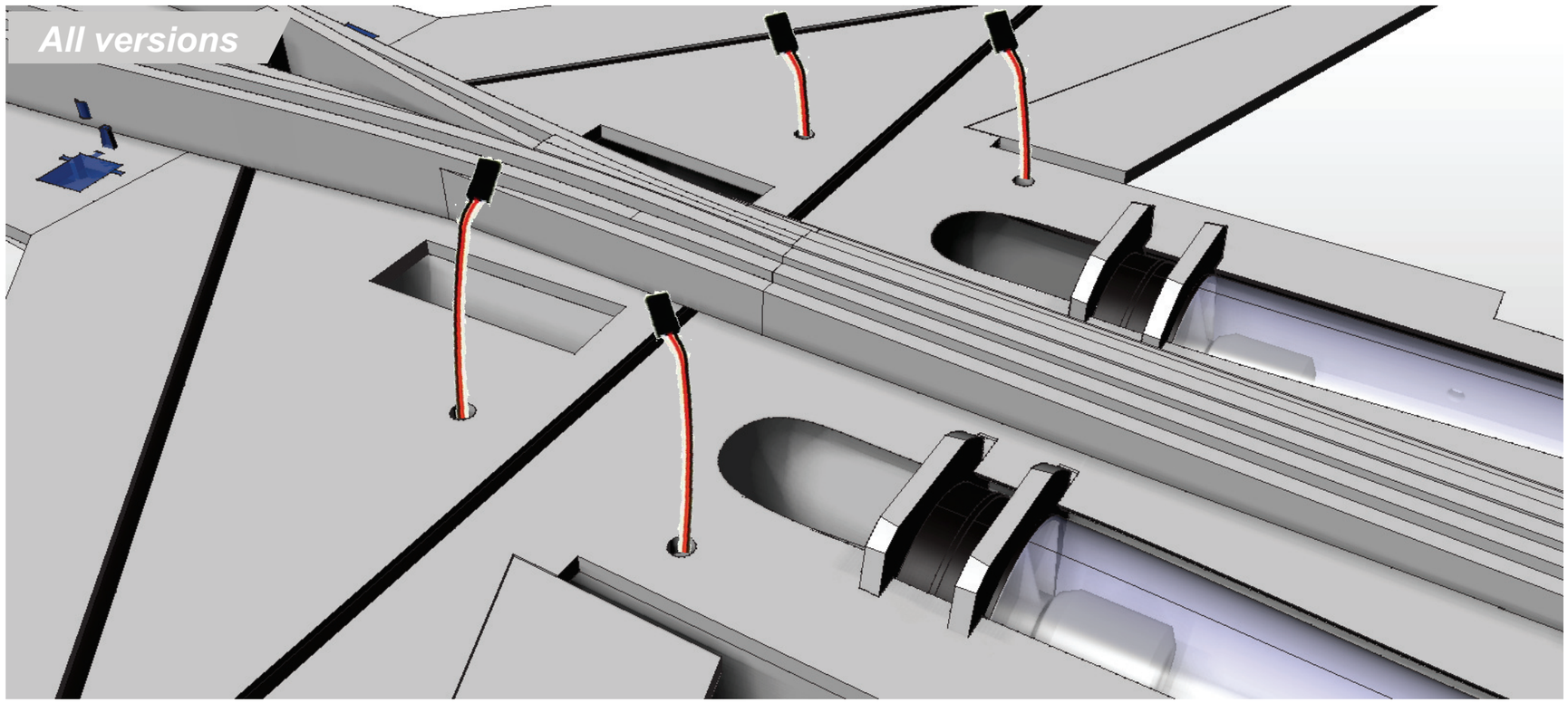




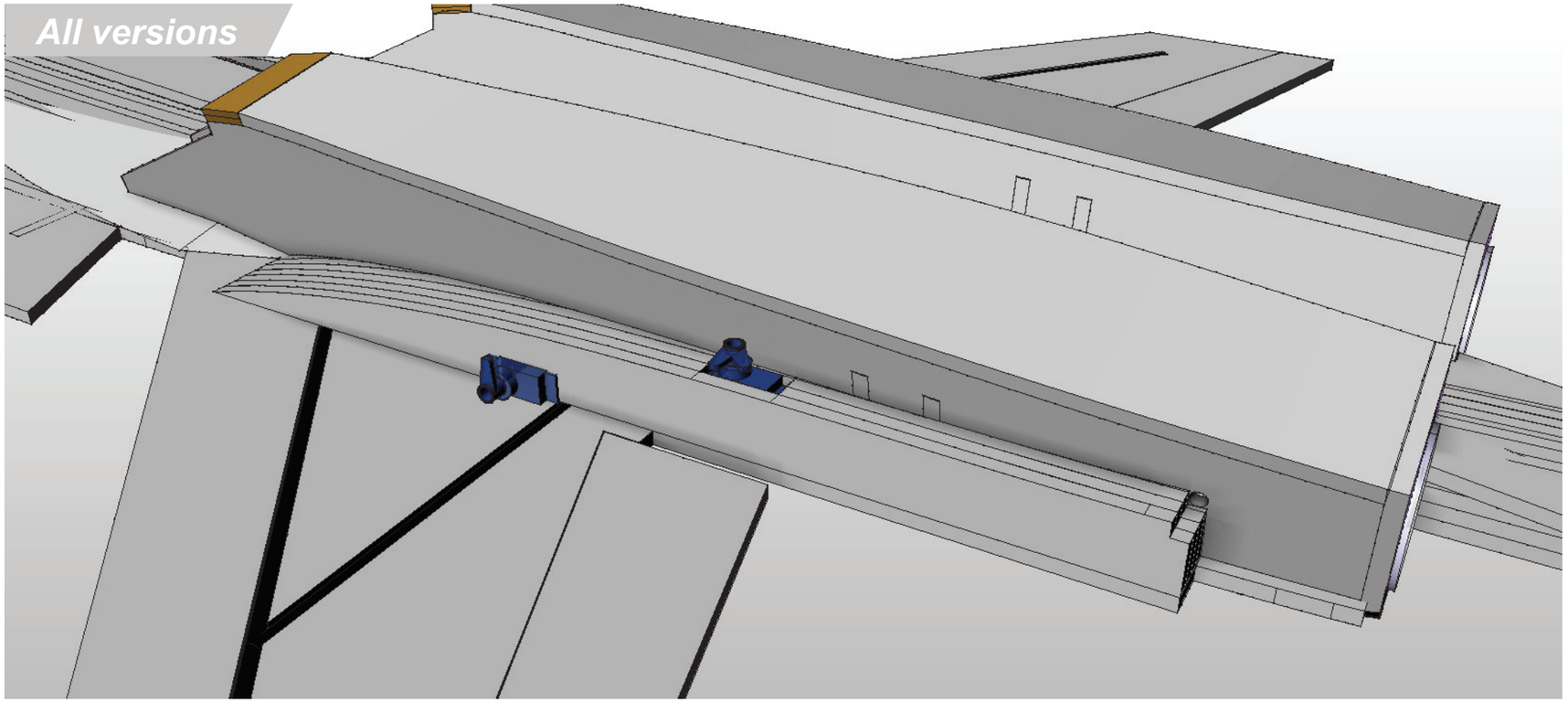
Using the half-circle shape marked on the **exhaust bulkheads**, shape the Nacelles to transition from square sectioned at the front to circular sectioned at the rear.

Trim away the bulk of the material using an extendable craft knife, then use a mini electric sander to quickly get the ideal shape.



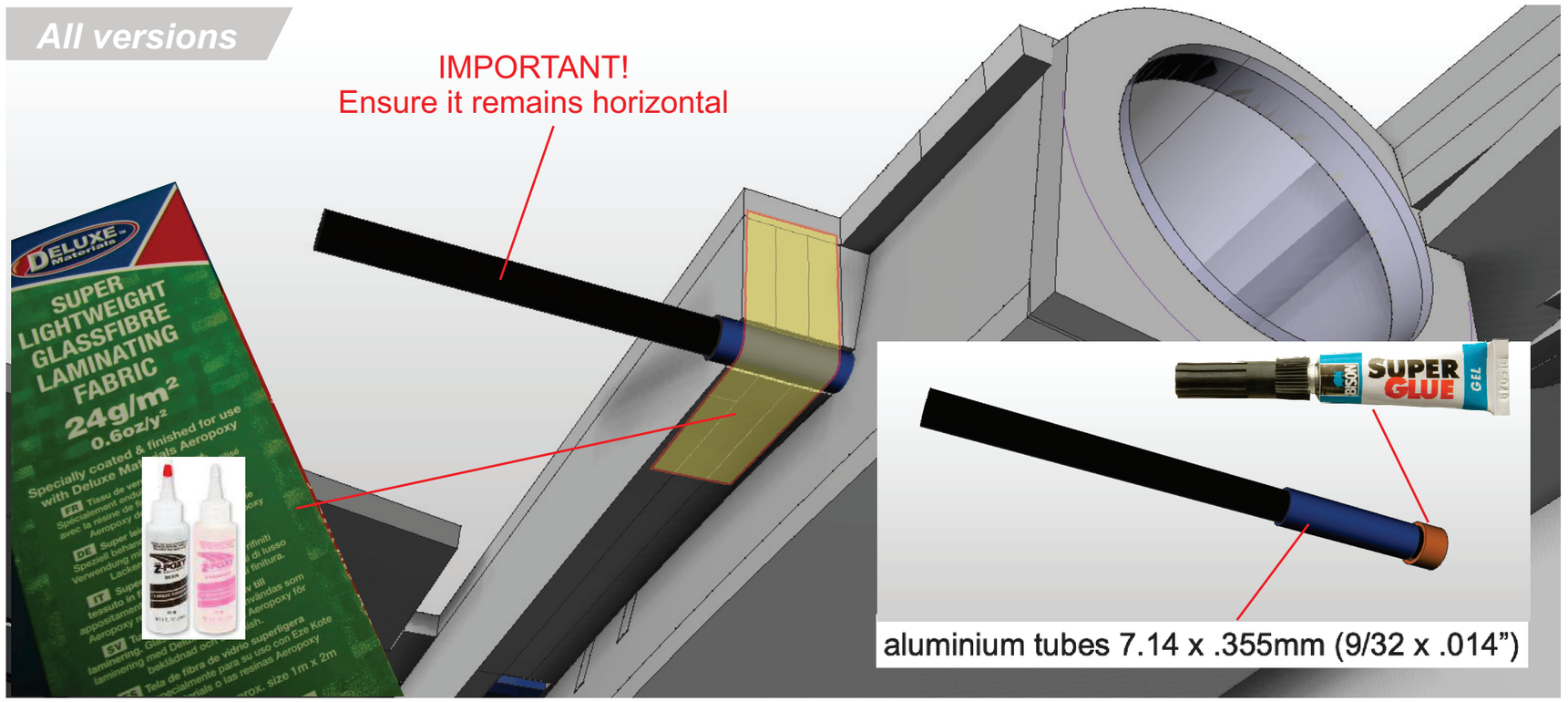



Run the servo wires through the holes to the upper side of the wing.  You may need to open up the holes in order to get the cables through.




Glue the servos in place using Hot melt Glue.



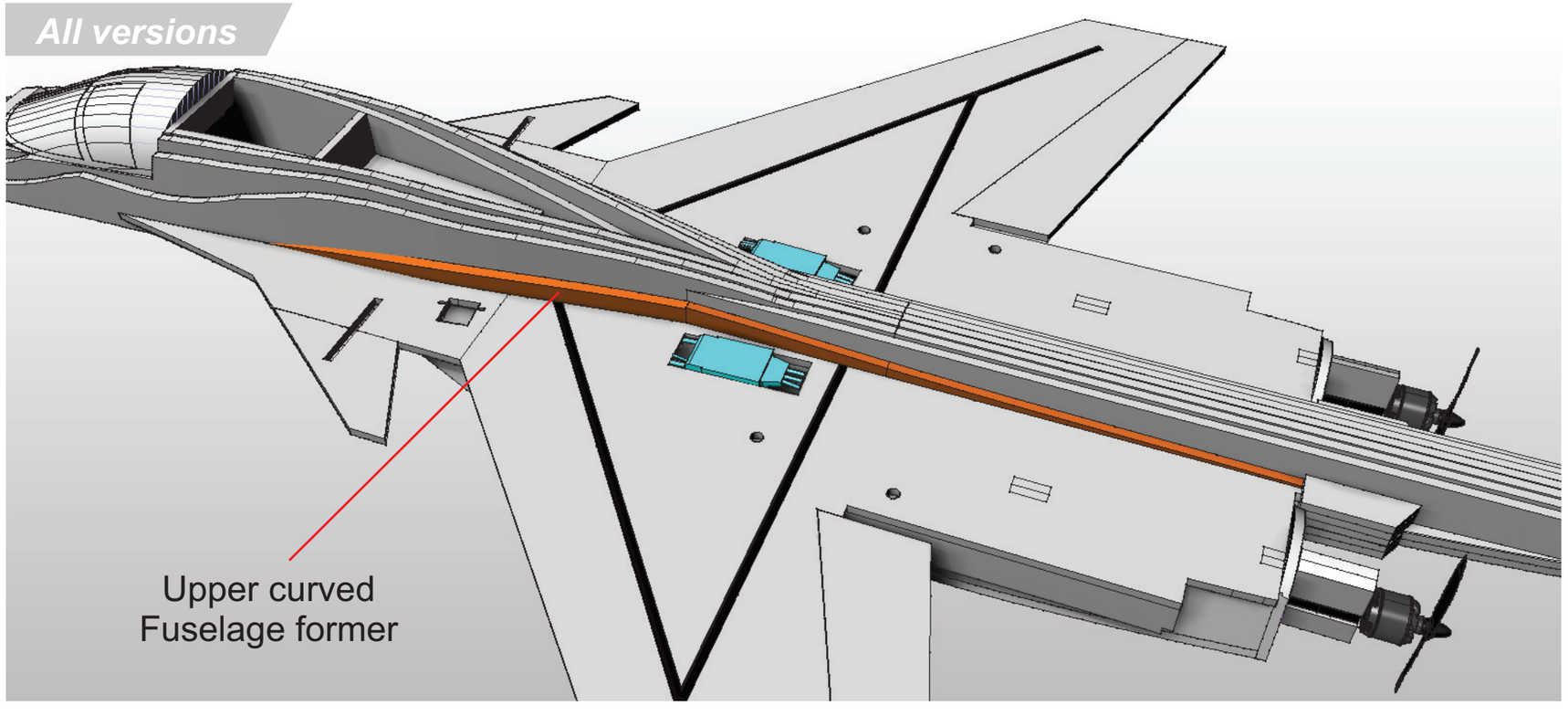



Drill out a prop saver and glue onto the end of the horizontal stabiliser spar using CA. Once the glue has set, slide aluminum tubes over the carbon spars.

Push the prop-saver end of the spar into the **Nacelle (outer)** ensuring the end doesn't interfere with the thrust tube (EDF only).

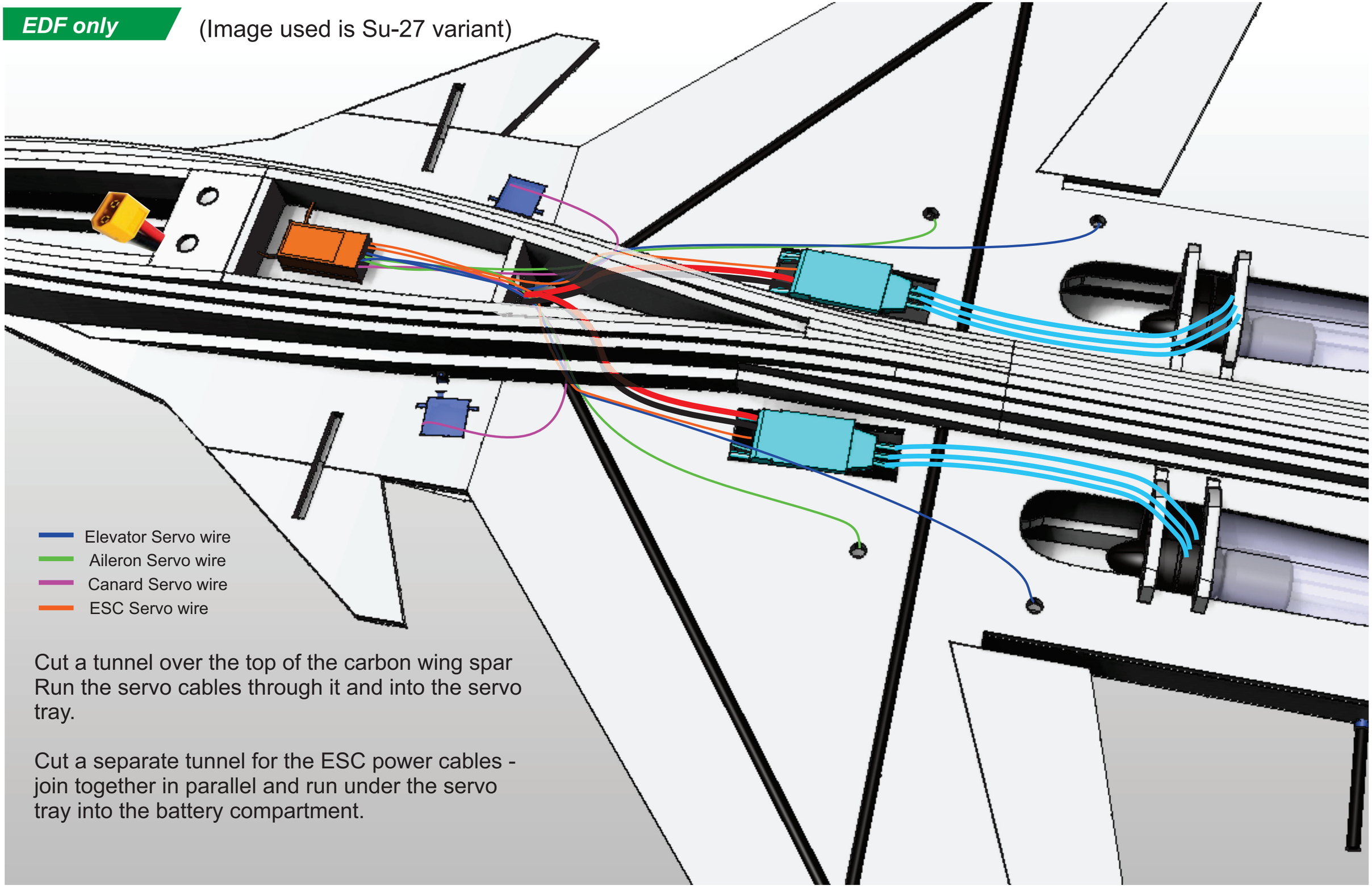
Ensuring that the spar can rotate glue the aluminium tube to the **Fuselage servo blocks** using epoxy and 0.6oz fibreglass.






Glue the **Upper curved fuselage former pieces** to the assembly. (Both sides)

**EDF only** (Image used is Su-27 variant)

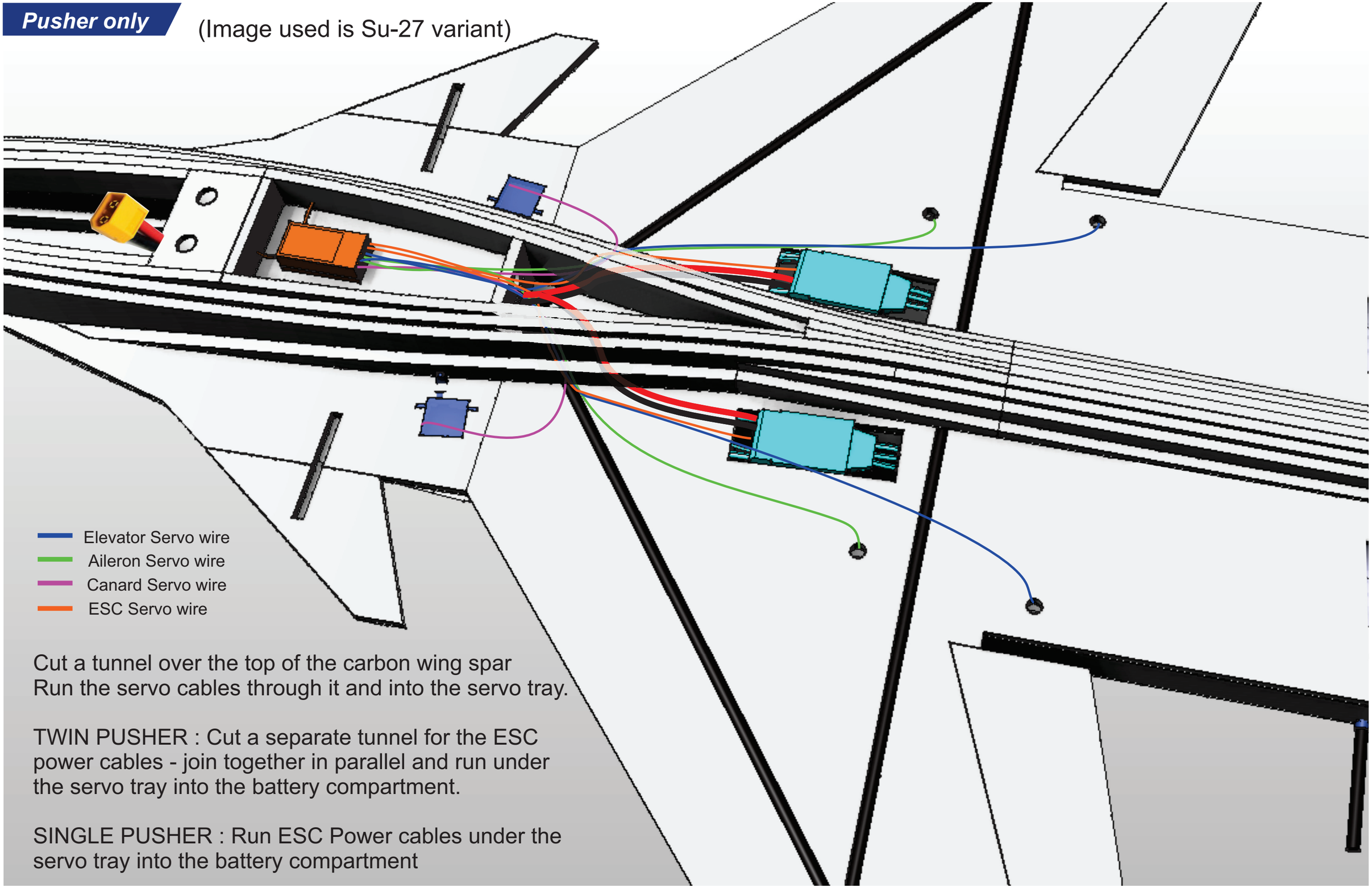



Cut a tunnel over the top of the carbon wing spar Run the servo cables through it and into the servo tray.

Cut a separate tunnel for the ESC power cables - join together in parallel and run under the servo tray into the battery compartment.

**Pusher only**

(Image used is Su-27 variant)

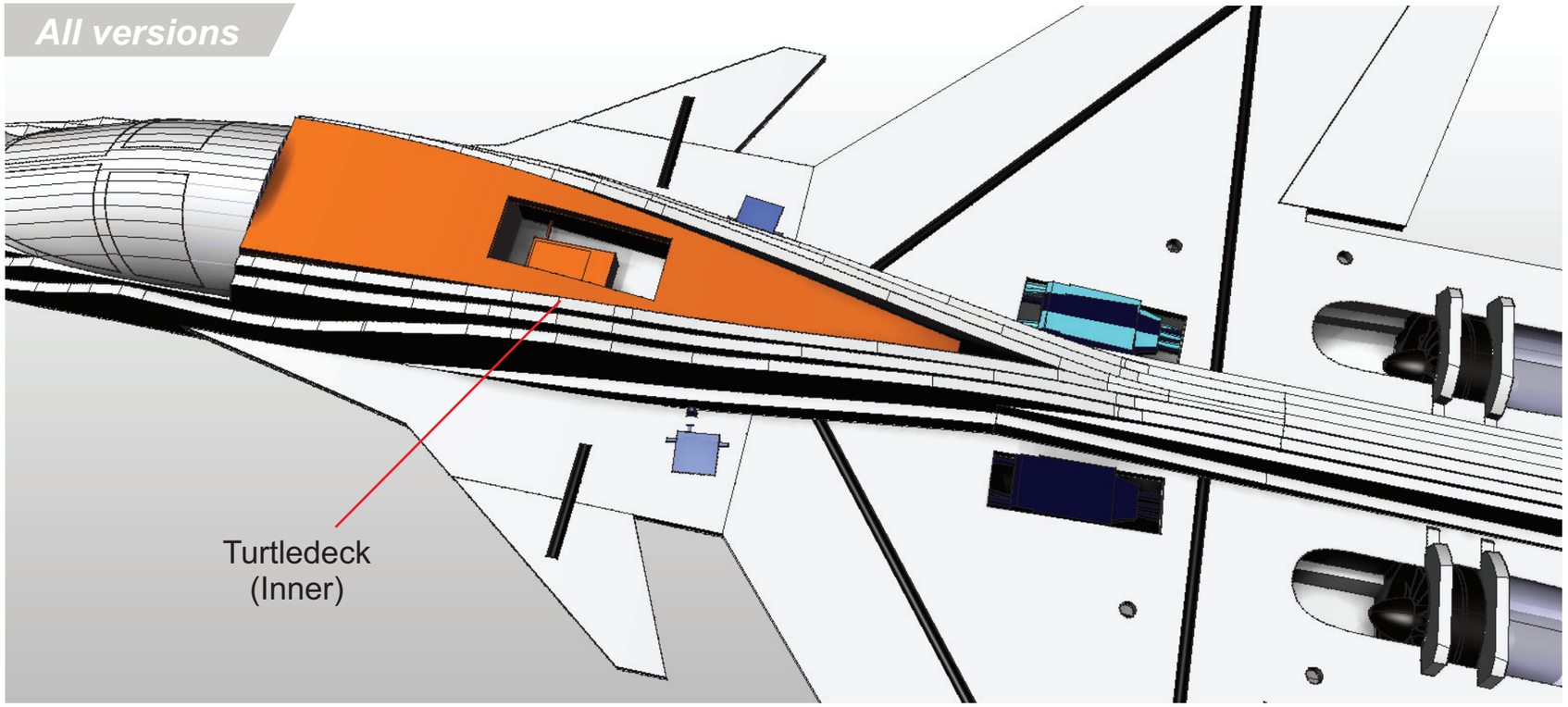



Cut a tunnel over the top of the carbon wing spar
Run the servo cables through it and into the servo tray.

TWIN PUSHER : Cut a separate tunnel for the ESC power cables - join together in parallel and run under the servo tray into the battery compartment.

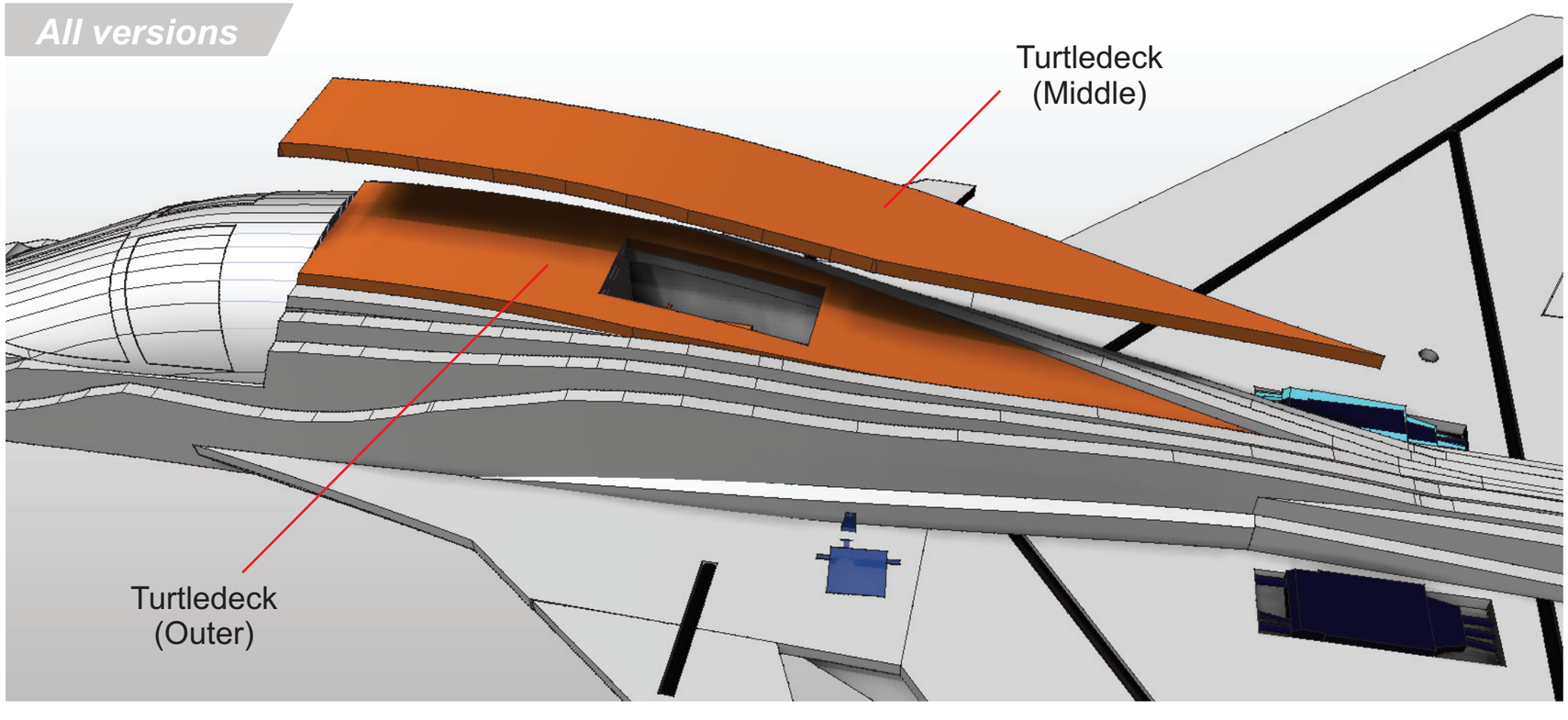
SINGLE PUSHER : Run ESC Power cables under the servo tray into the battery compartment

*All versions*




Glue the **Turtledeck (Inner)** to the assembly.


*All versions*

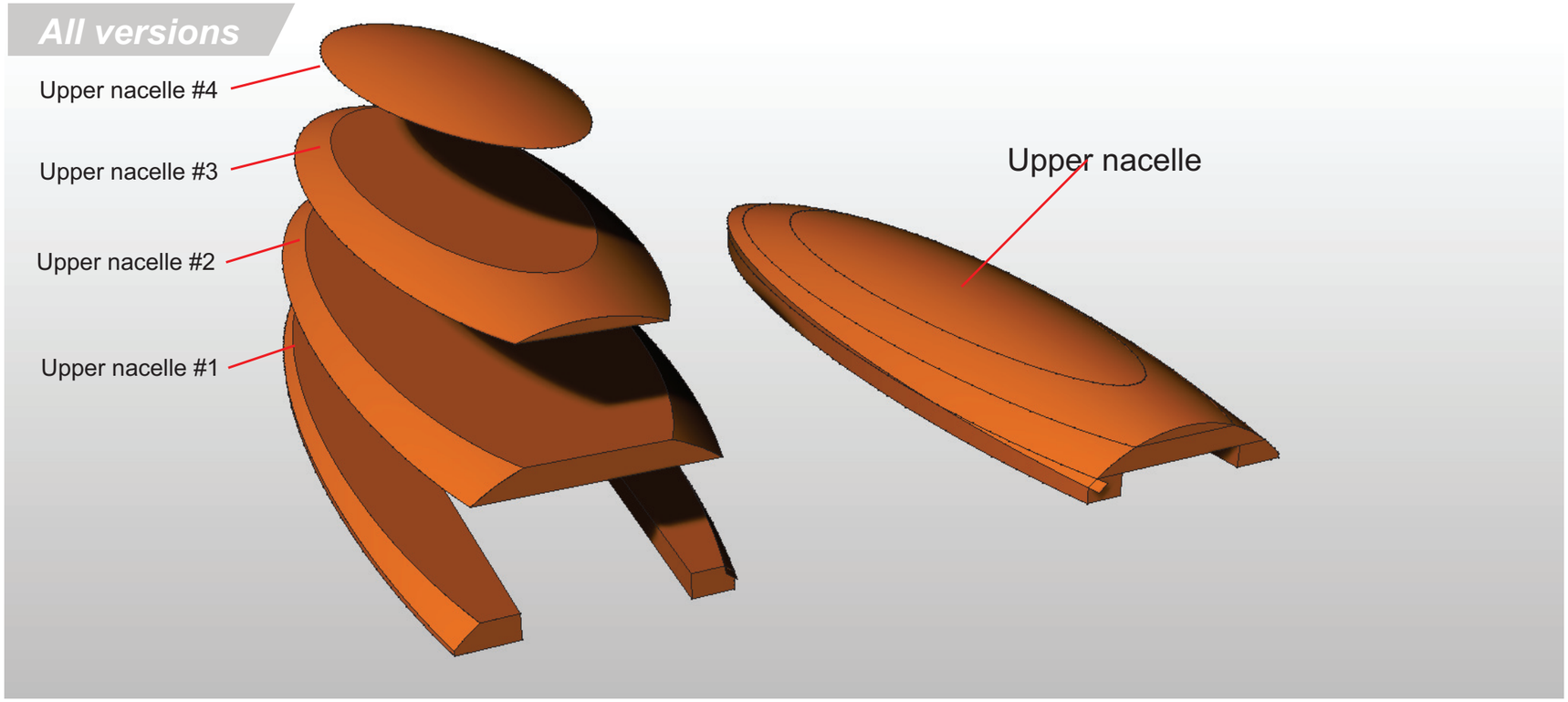



Glue the **Turtledeck (Outer and Middle)** to the assembly.

You may wish to add an RX access hatch just here. Either create a magnet fixing or a couple of light drops of glue as hopefully you won't need to access here often.

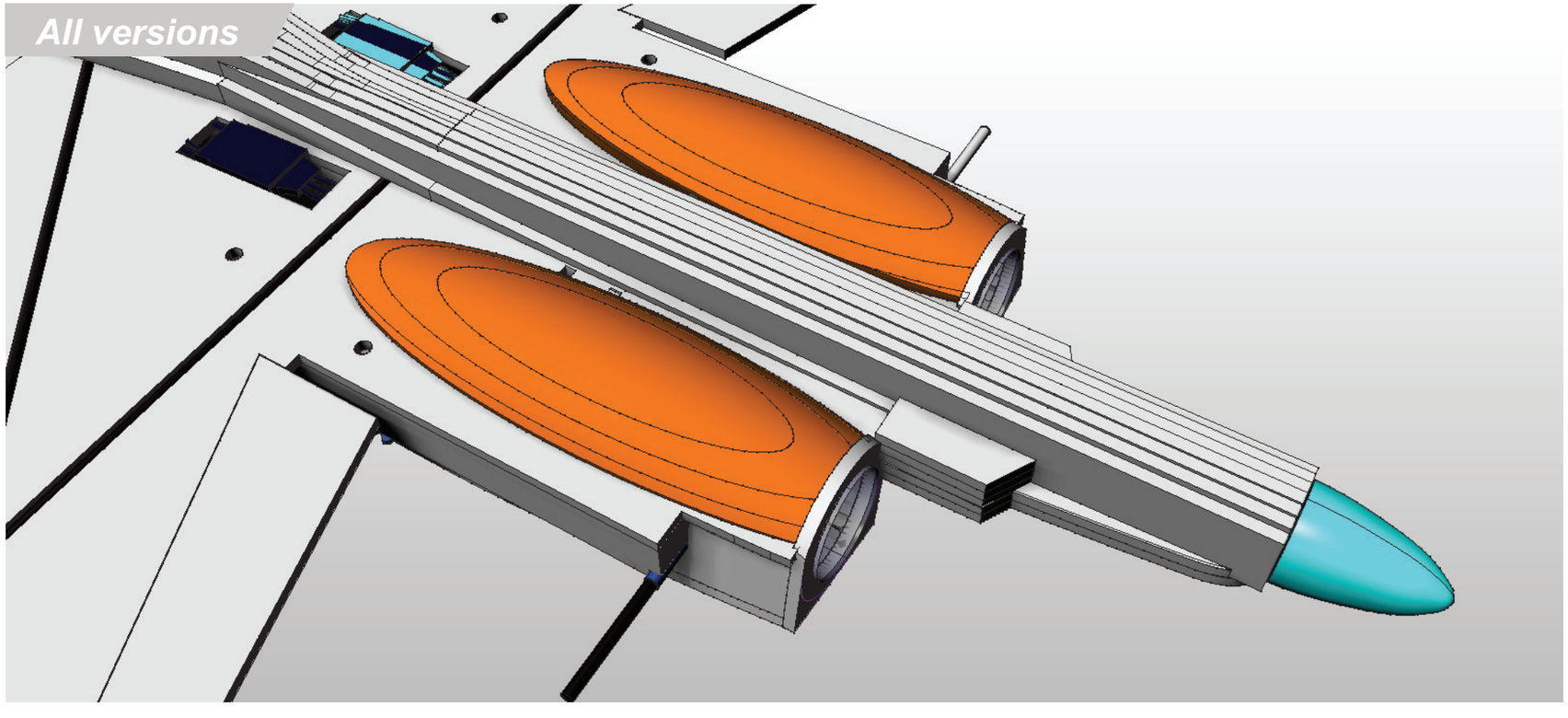



*All versions*




Glue the **Upper Nacelles** together and sand smooth.

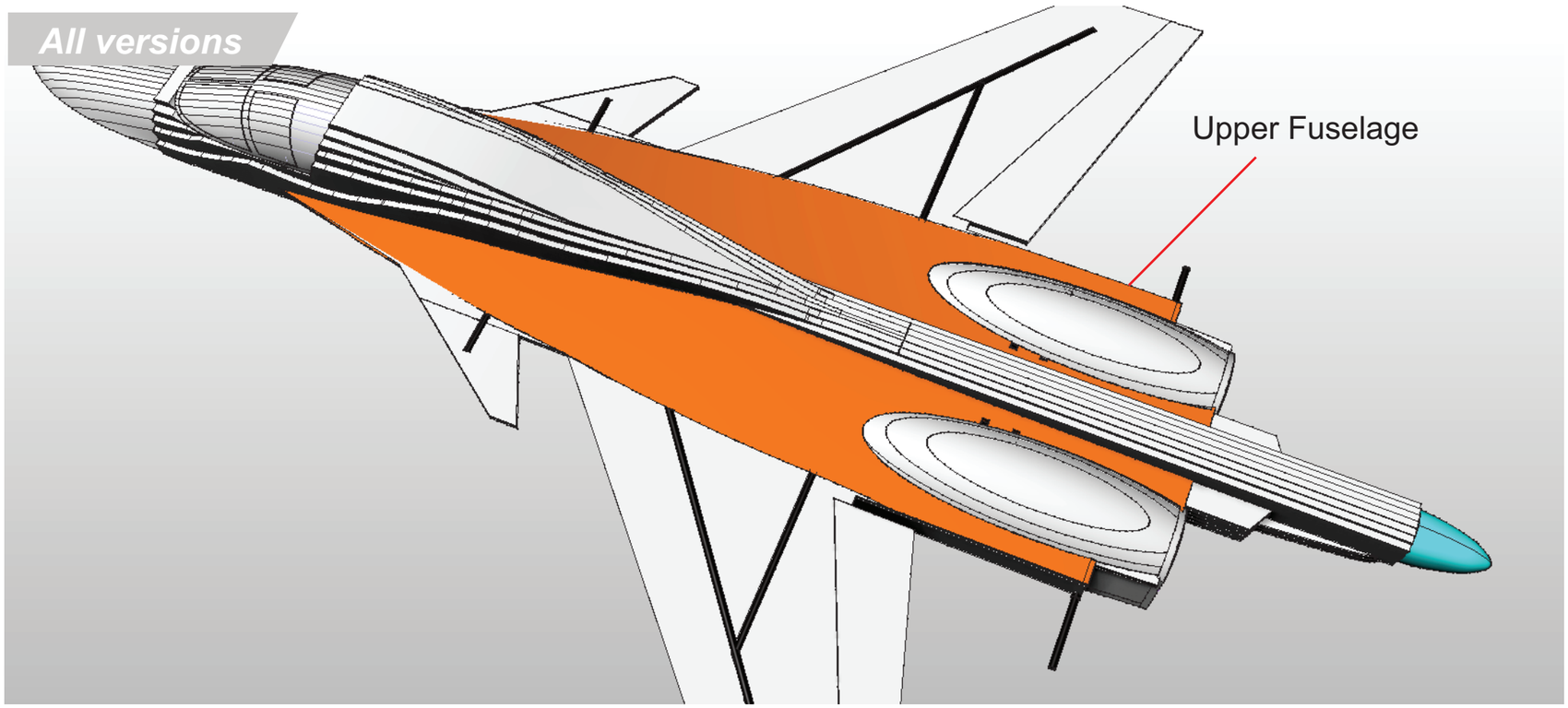

*All versions*



Glue the **Upper Nacelles** to the assembly - trimming away for the EDF bulkheads where necessary.

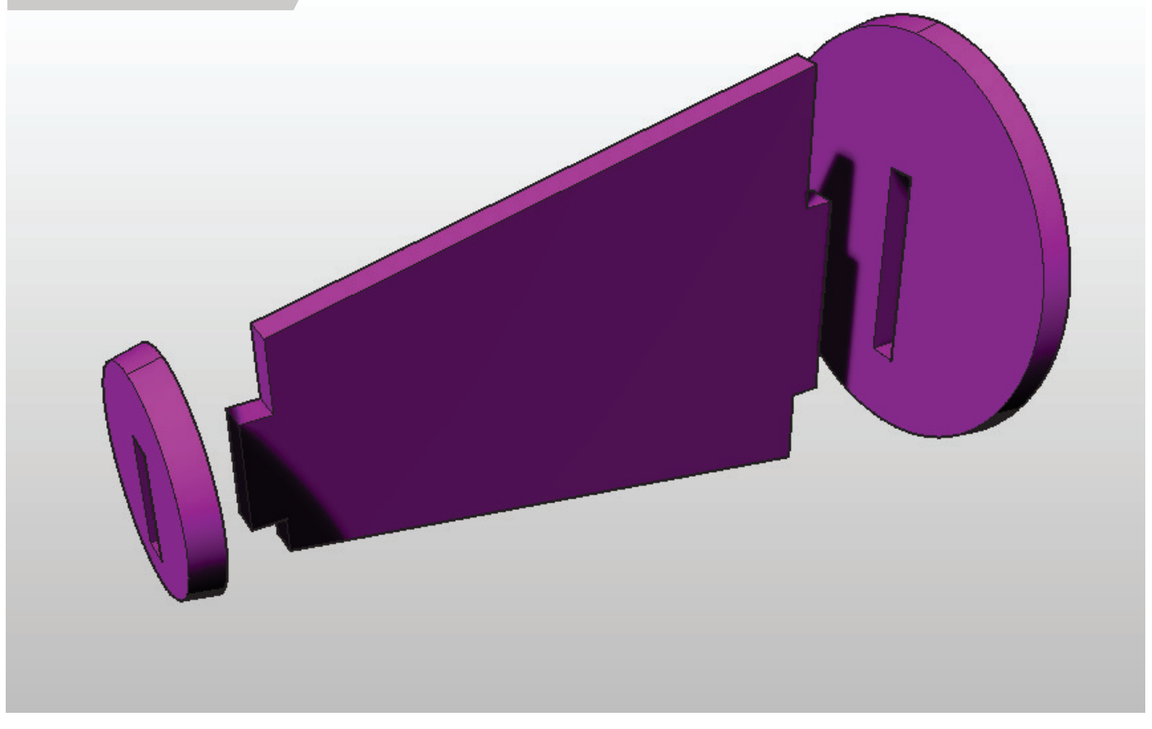


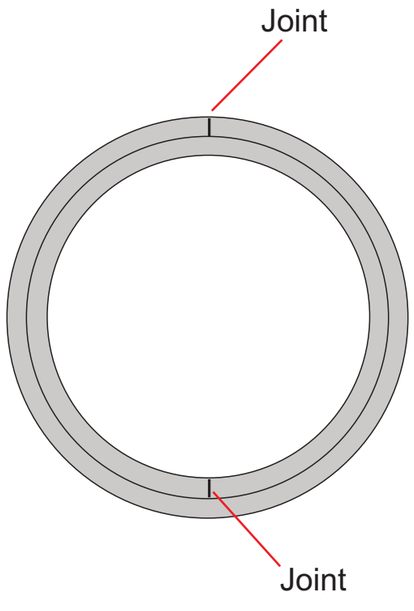

*All versions*




Pre-shape and test fit to get the correct shape. Glue the **Upper Fuselage** parts to the fuselage.


*All versions*



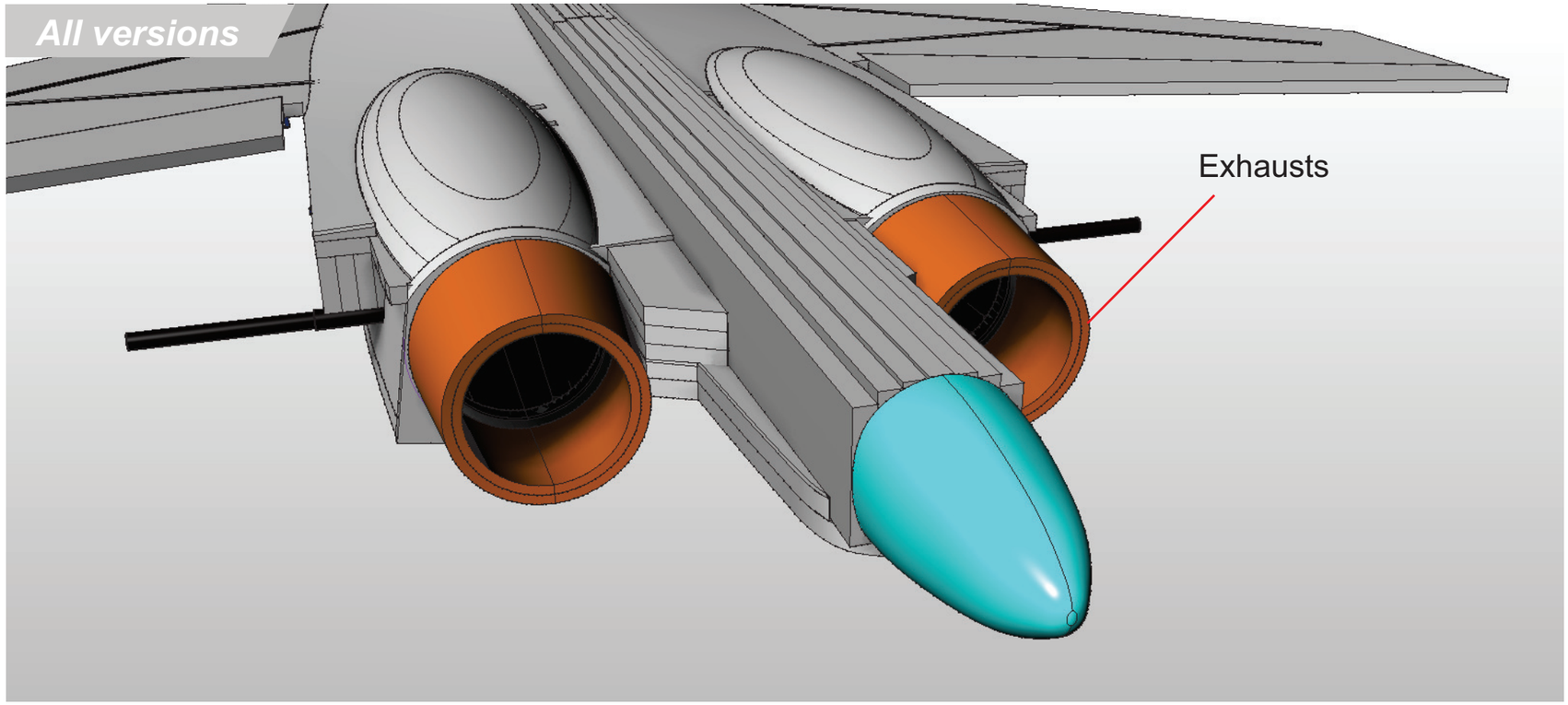



If you are not using a 3D printed exhaust, then Glue the **Exhaust jig** together.

Use 2 layers of 3mm depron, joining the two ends at opposite ends (see diagram).

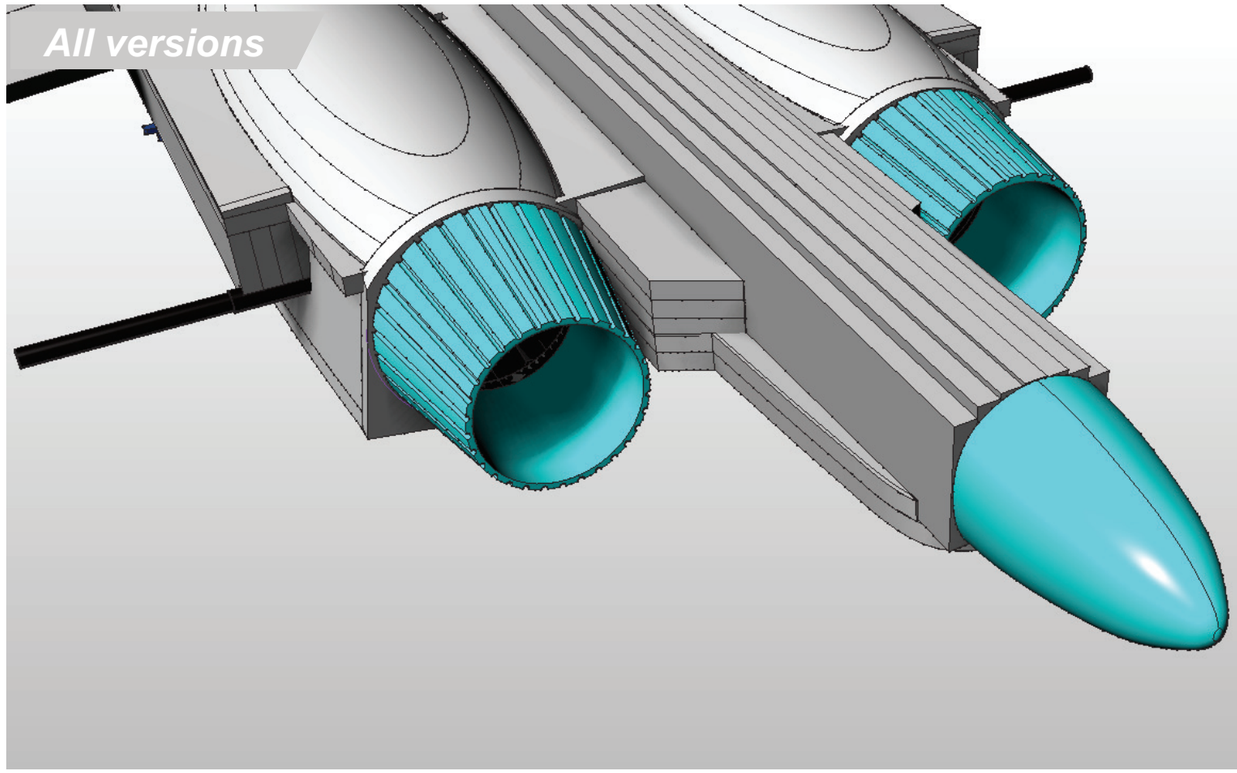
Make over-long, then trim and sand back to the jig faces to get a good finished face.



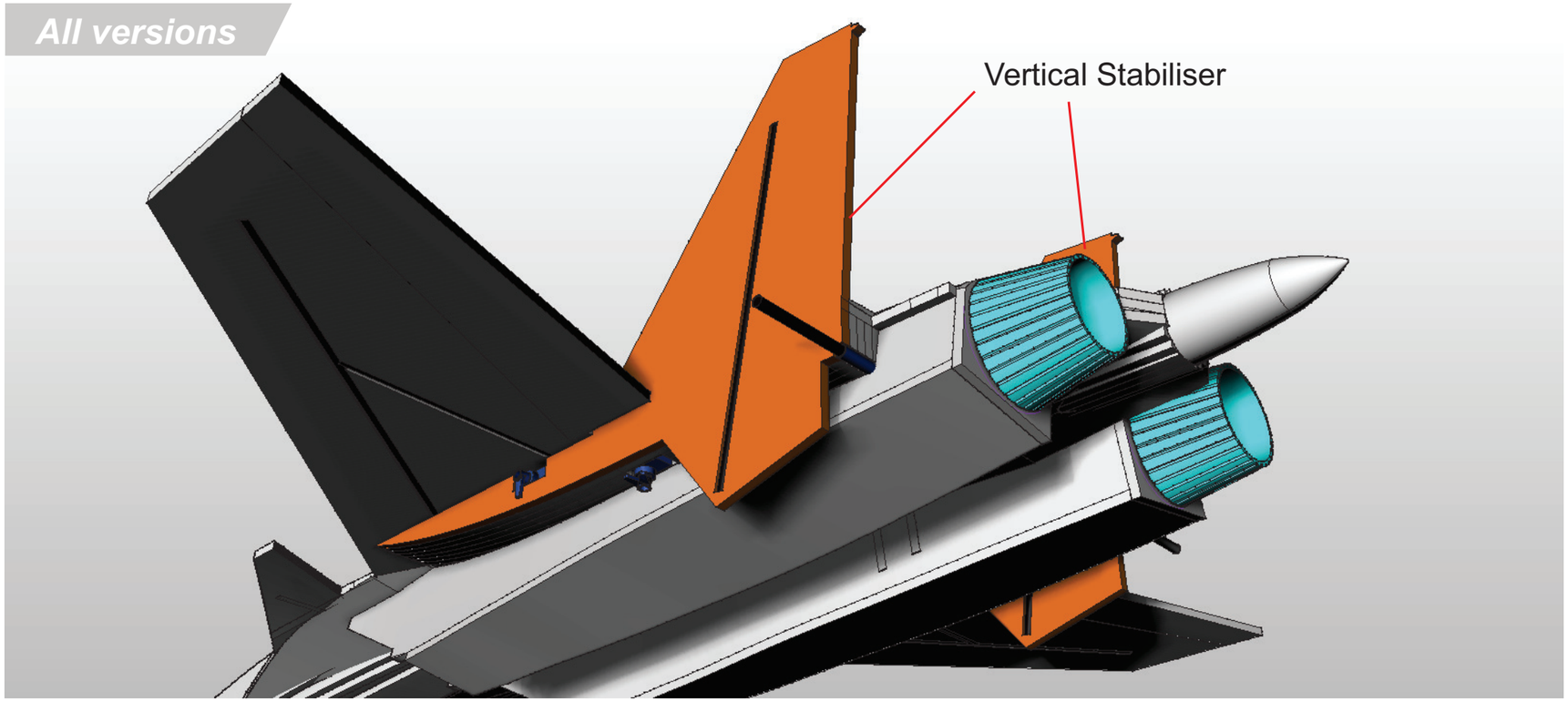

Glue the **Exhausts** to the fuselage.

**C**hoose the correct degree of tapering to suit your EDF choice.



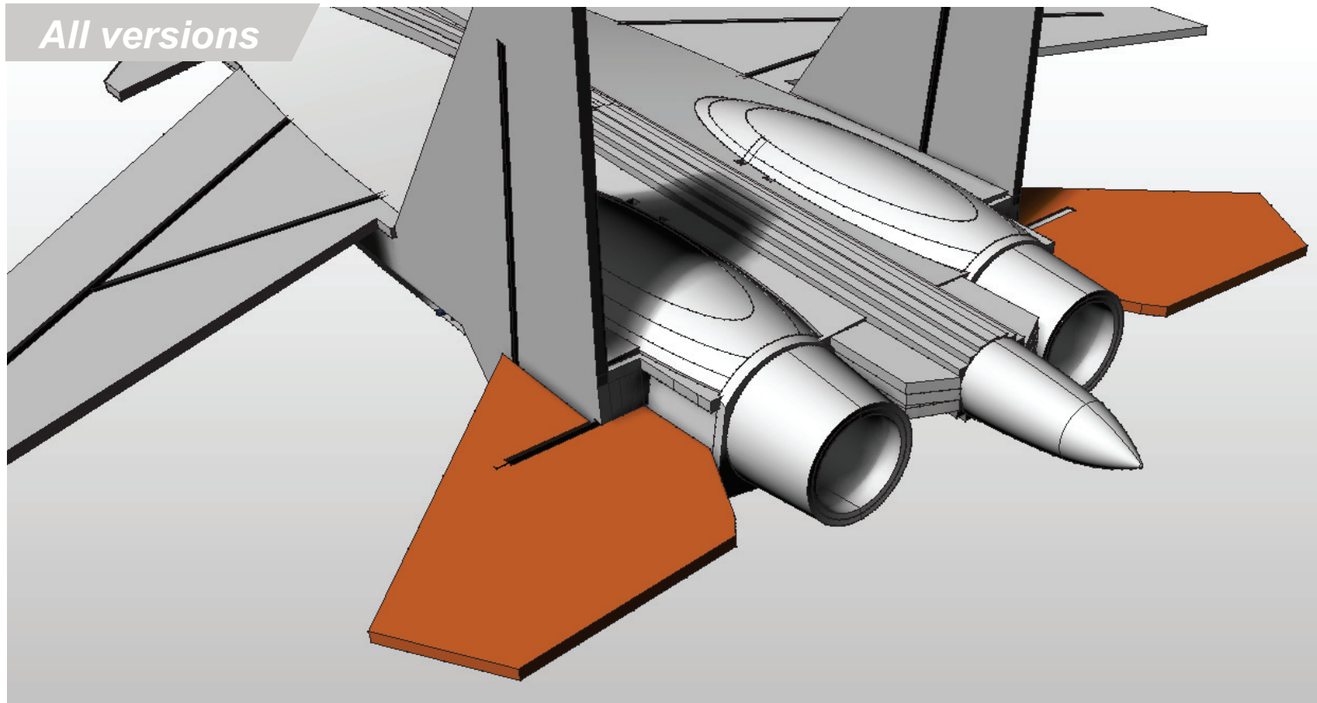

3D Printed Part
(optional)

*All versions*




Glue the **Vertical Stabilisers** to the fuselage.


*All versions*

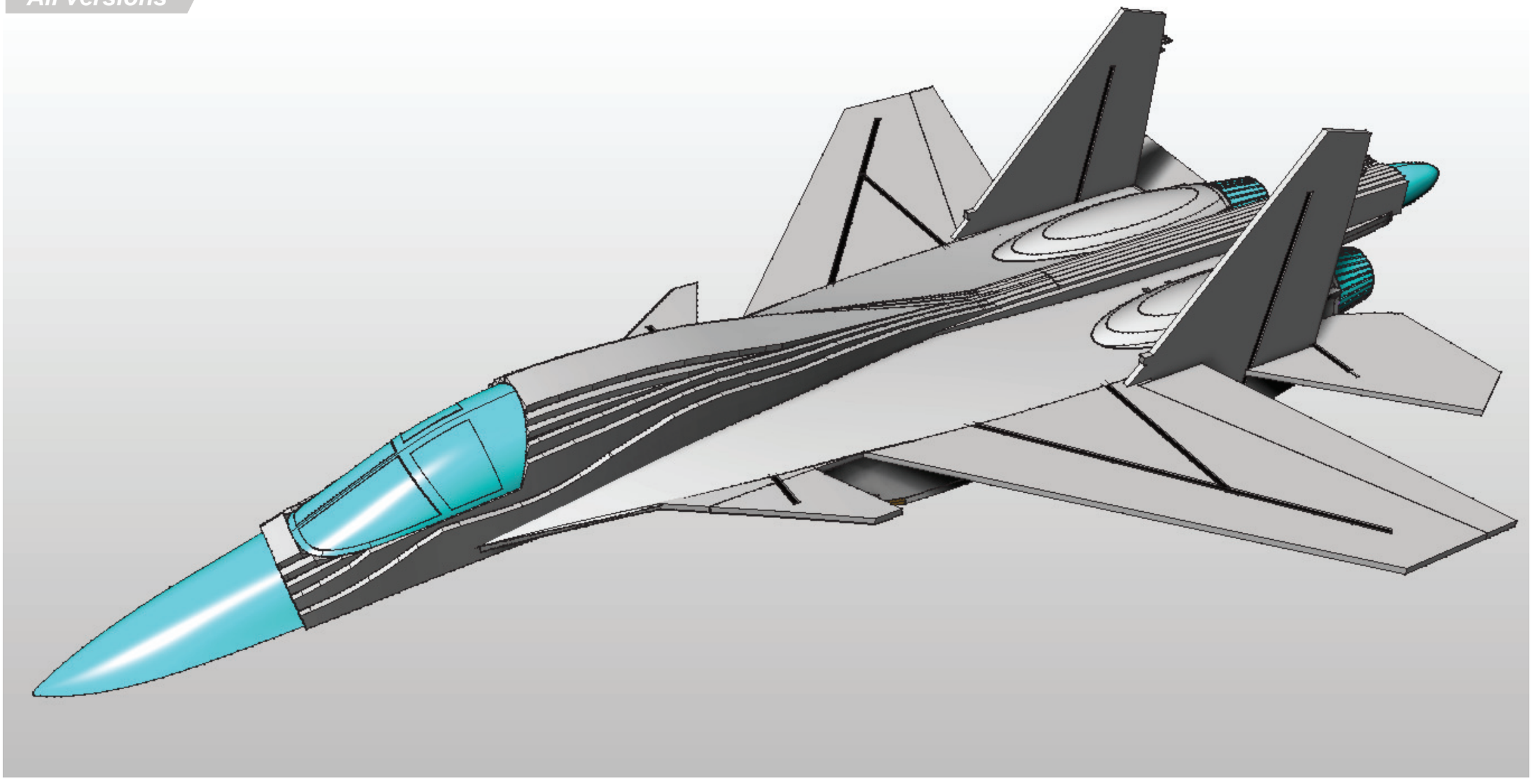


Epoxy the **Horizontal Stabilisers** to the carbon elevator spars protruding from the fuselage. Use masking tape to prevent spillage.

Ensure both are supported well while the epoxy sets.

Use lite-ply control horns set within the depron to connect to your rear servos.





Congratulations!  Your model is now complete.

Either fly it as it is, or go on to paint it!



There are various photos of the Fullback available on Google images to help you with the shaping and details.