

Version 2.0

JETWORKS



Sukhoi Su-57
Felon
Parkjet

NON - 3D PRINTED PARTS VERSION

Photograph of actual aircraft.



5th Generation Jet Fighter

Construction Guide

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Su-57 Felon History

The Sukhoi Su-57 (Russian: Сухой Су-57; NATO reporting name: Felon) is a stealth, single-seat, twin-engine multirole fifth-generation jet fighter being developed since 2002 for air superiority and attack operations. The aircraft is the product of the PAK FA a fifth-generation fighter programme of the Russian Air Force. Sukhoi's internal name for the aircraft is T-50. The Su-57 is planned to be the first aircraft in Russian military service to use stealth technology.

Its maiden flight took place on 29 January 2010 and the first production aircraft was expected to be delivered in 2019 with a second to follow in 2020 but is being delayed due to a crash in late December 2019.

The fighter is designed to have supercruise, supermaneuverability, stealth, and advanced avionics to overcome the prior generation fighter aircraft as well as ground and naval defences. The Su-57 is intended to succeed the MiG-29 and Su-27 in the Russian Air Force and have a service life of up to 35 years.

The Su-57 is a fifth-generation multirole fighter aircraft and the first operational stealth aircraft for the Russian Air Force. The aircraft is stealthy, supermaneuverable, has supercruise capability, incorporate substantial amounts of composite materials and possess advanced avionics such as active phased-array radar and sensor fusion.

The aircraft has a blended wing body fuselage and incorporates all-moving horizontal and vertical stabilizers; the vertical stabilizers toe inwards to serve as the aircraft's airbrake. The aircraft incorporates thrust vectoring and has adjustable leading-edge vortex controllers (LEVCONs) designed to control vortices generated by the leading edge root extensions, and can provide trim and improve high angle of attack behaviour, including a quick stall recovery if the thrust vectoring system fails. The advanced flight control system and thrust vectoring nozzles make the aircraft departure-resistant and highly manoeuvrable in both pitch and yaw, enabling the aircraft to perform very high angles of attack manoeuvres such as the Pugachev's Cobra and the bell maneuver, along with doing flat rotations with little altitude loss.

Weapons are housed in two tandem main weapons bays between the engine nacelles and smaller bulged, triangular-section bays near the wing root. Internal weapons carriage eliminates drag from external stores and enables higher performance compared to external carriage, as well as enhancing stealth.

The Su-57 is planned to be the first operational aircraft in Russian Air Force service to use stealth technology. The Su-57's design emphasizes frontal stealth, with RCS-reducing features most apparent in the forward hemisphere; the shaping of the aft fuselage, the seams between parts, and rivets are much less optimized for radar stealth compared to the F-22. The combined effect of airframe shape and RAM of the production aircraft is estimated to have reduced the aircraft's RCS to a value thirty times smaller than that of the Su-27.

Designers Notes

The real Su-57 is a very remarkable aircraft and has quite a complex shapes, unlike the F-22 Raptor which has lots of simple surfaces to help reduce radar reflectivity. It has been quite a challenge to try to accurately capture the lines of the original design whilst keeping the build as simple as possible. I hope I have achieved that.

This non-3d printed Su-57 Felon was designed to be powered by either :-

a single pusher prop

or

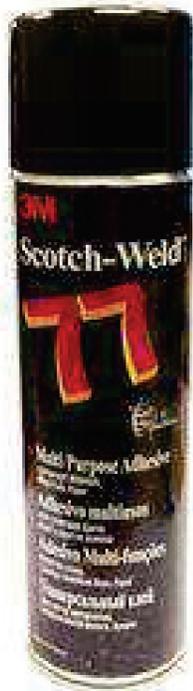
twin EDF's - either 50mm or 64mm.

The 64mm EDF will benefit from a bungee launch to help it get airborne.

This guide is for building the model without 3D printed parts only. If you wish to use 3d printed parts use the '3d printed' construction guide



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

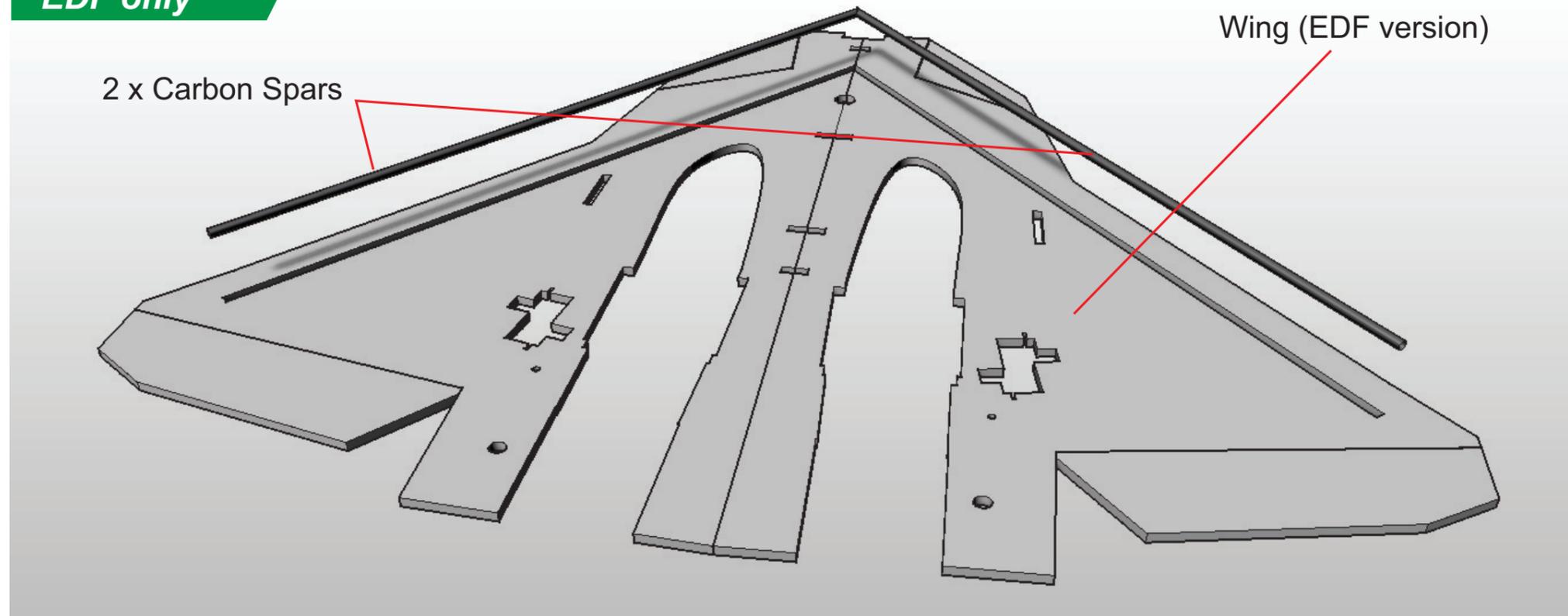
1. Print the plans,
 2. Cut around each part using scissors - allow a border of approx (1/4") 6mm
 3. Use either 3M spray mount or a very light coat of 3M 77 to the back of the parts and stick in an economical layout on the Depron foam.
 4. Using a safety rule and craft knife over a cutting mat - important! 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.



EDF only

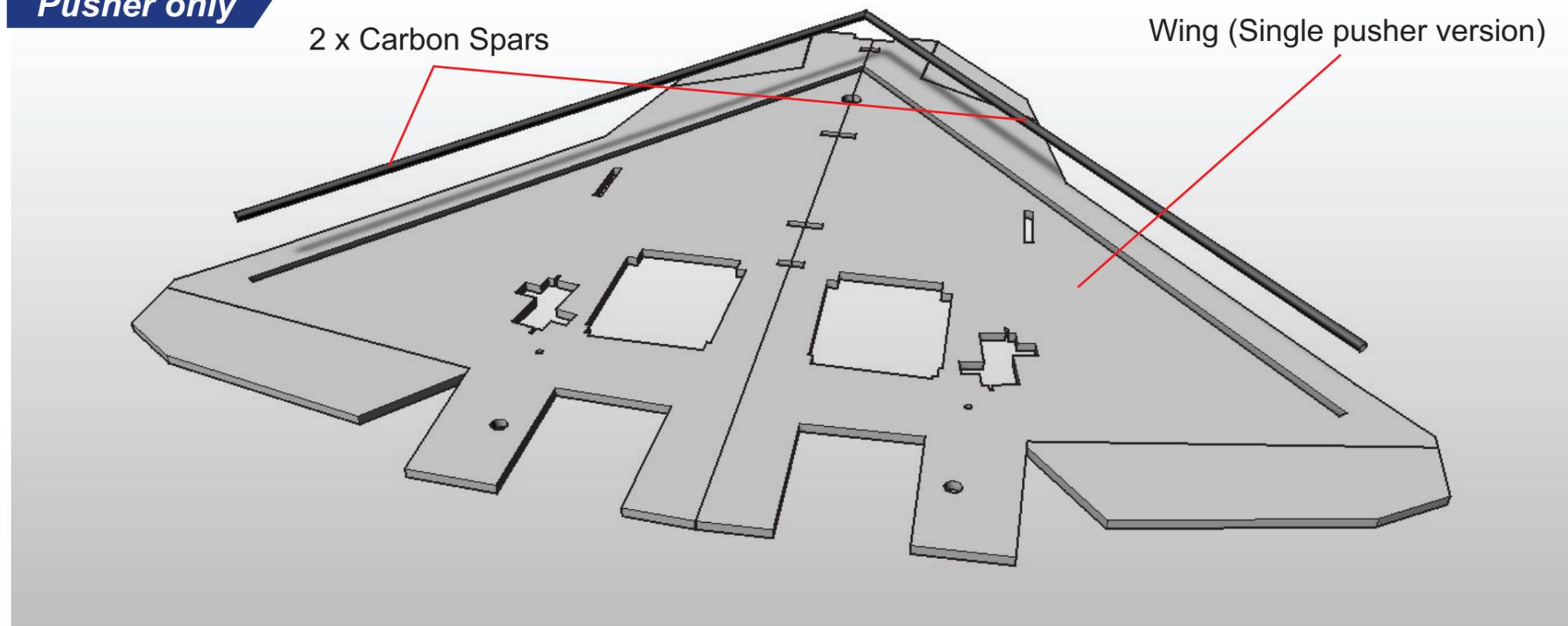


Choose which power system you wish to use, then glue the epoxy 6mm Carbon tubes into the slots of the relevant wing panel.

Mitre them together where they meet

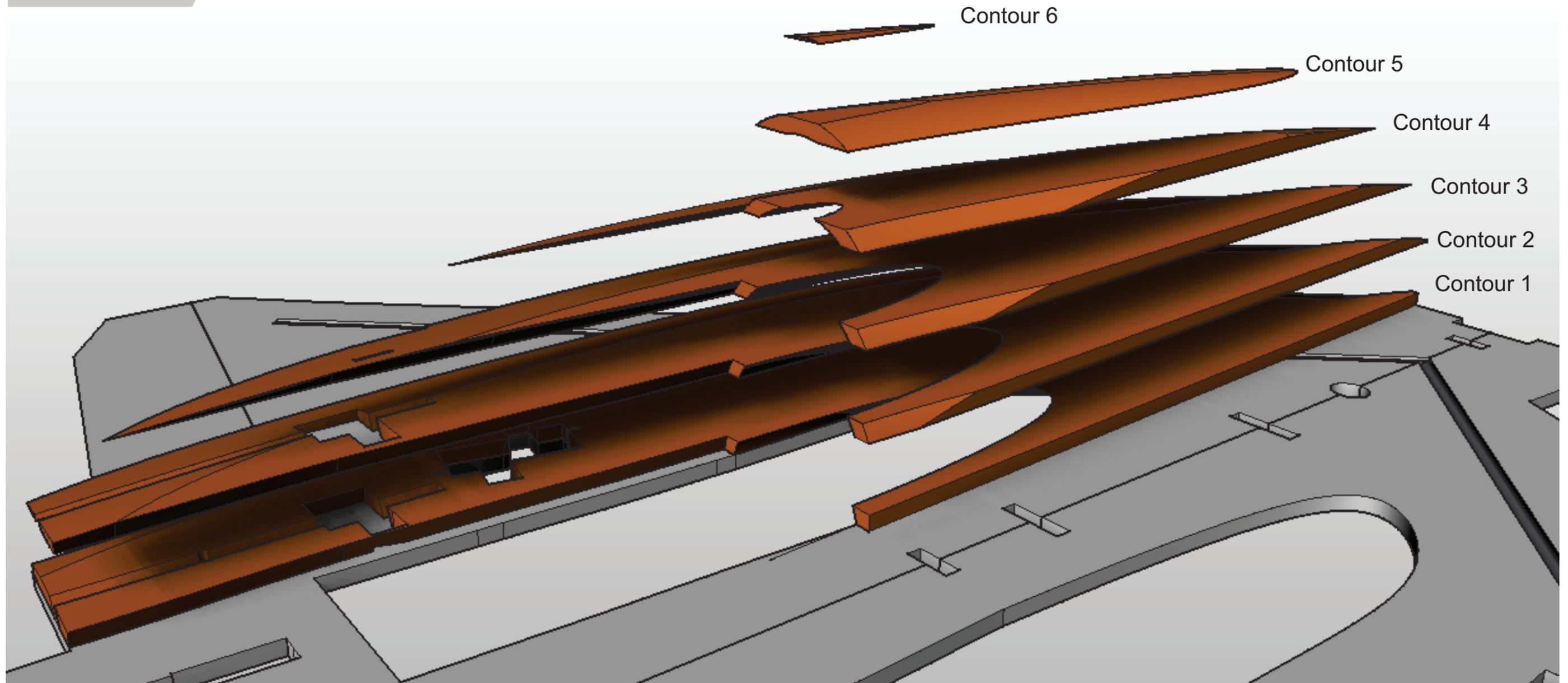
Use masking tape, top and bottom to keep the glue flush to the faces of the depron, and use lightweight filler to fill any gaps.

Pusher only



If you are not using rudders then you don't need to cutout the rear servo cutout.





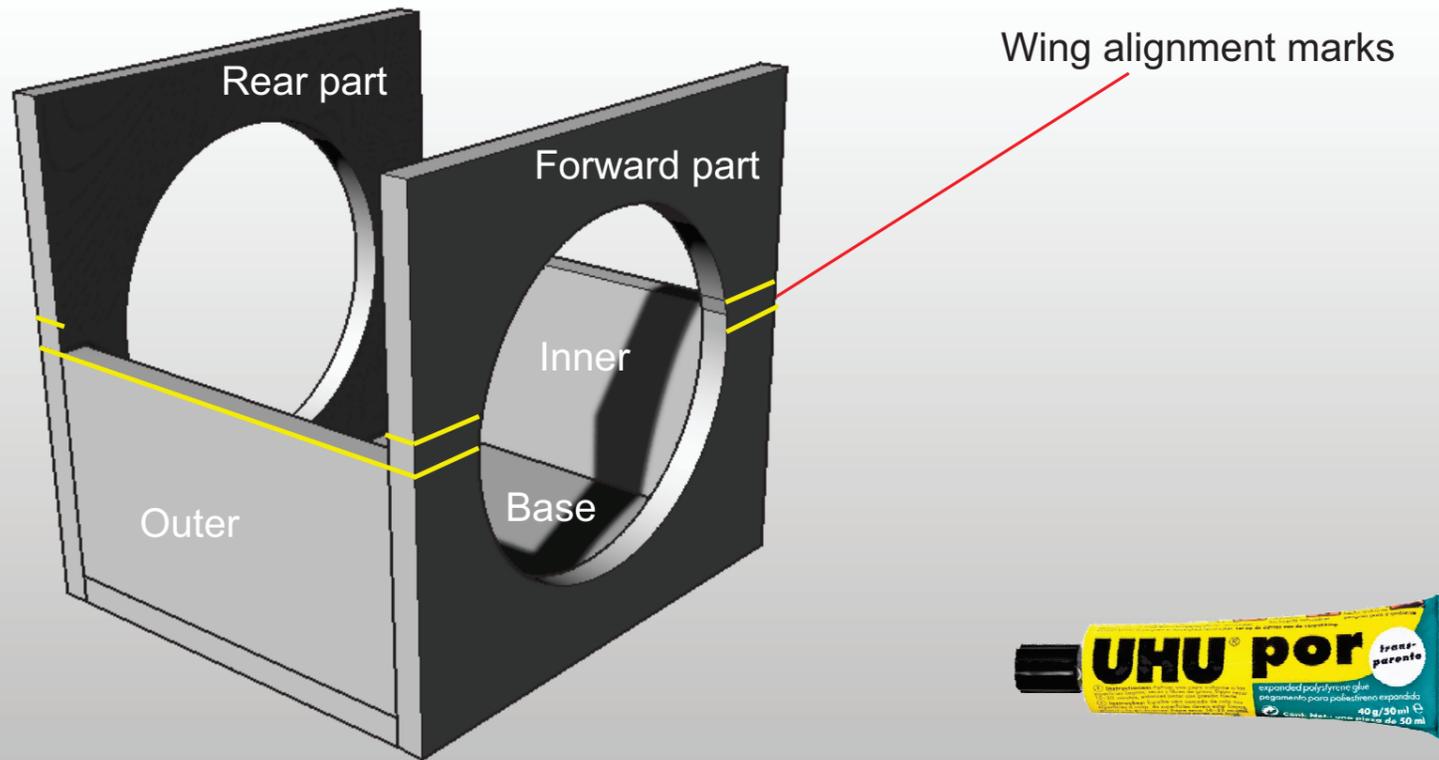
Pre-shape the contoured fuselage pieces to be around 90% complete, then finished sanding when all are together to get the correct shapes.

Laminate the 6 pieces using UHU Por.



All versions

Forward nacelle tube assembly JIG



FORWARD NACELLE JIG

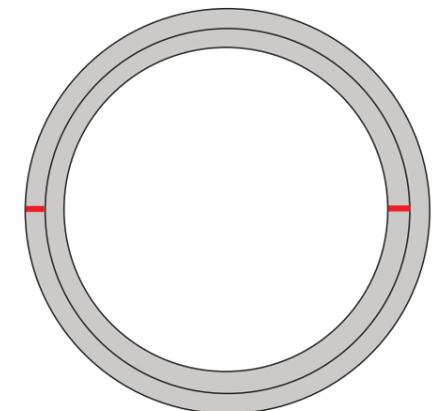
Build a pair of mirrored jigs to make both forward Nacelles from 3mm foam sheet.

Please note that these are not 'square' the forward part is angled.

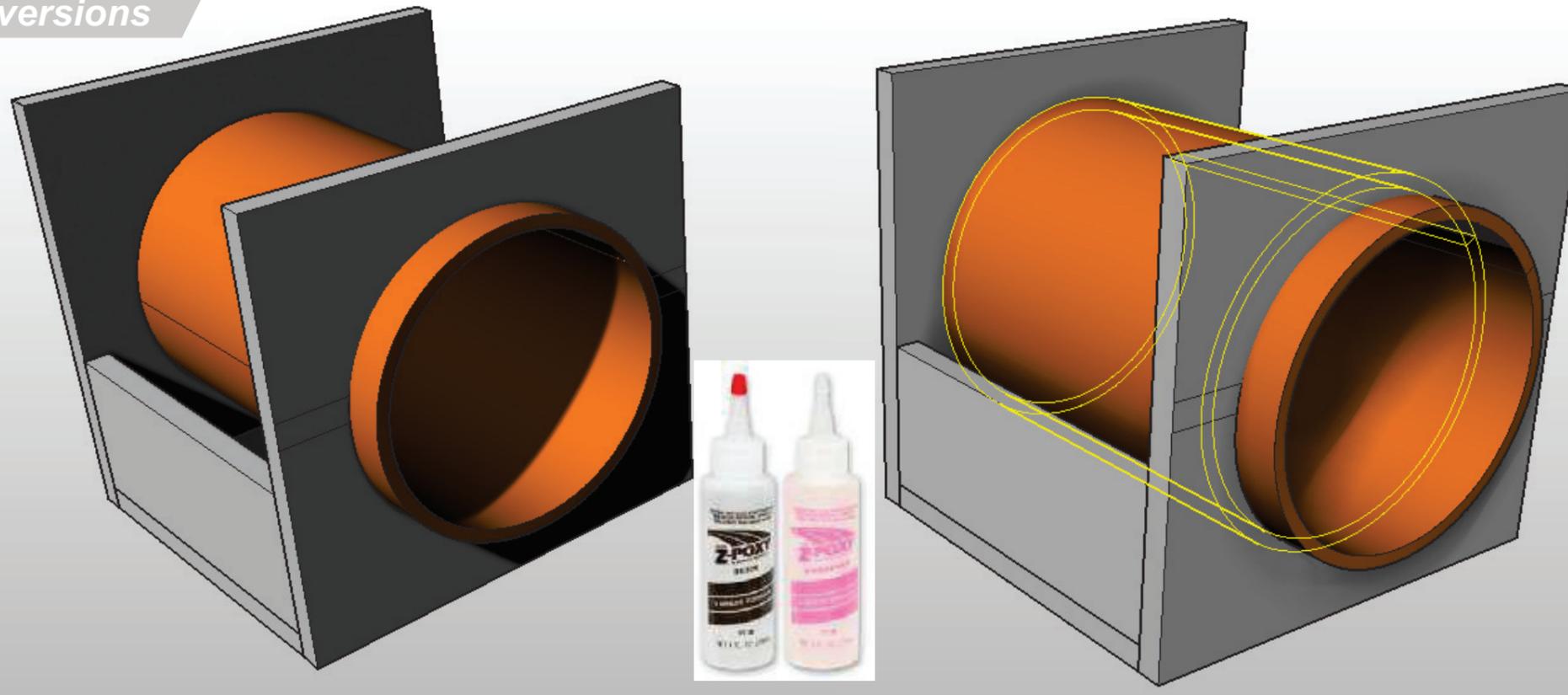
Mark on the wing alignment marks as shown on the plans.

Create the inner part of the nacelle 'tube' using 3mm foam sheet, passing through both holes. Use a circular 'plug' if you need to help hold the correct shape within the holes.

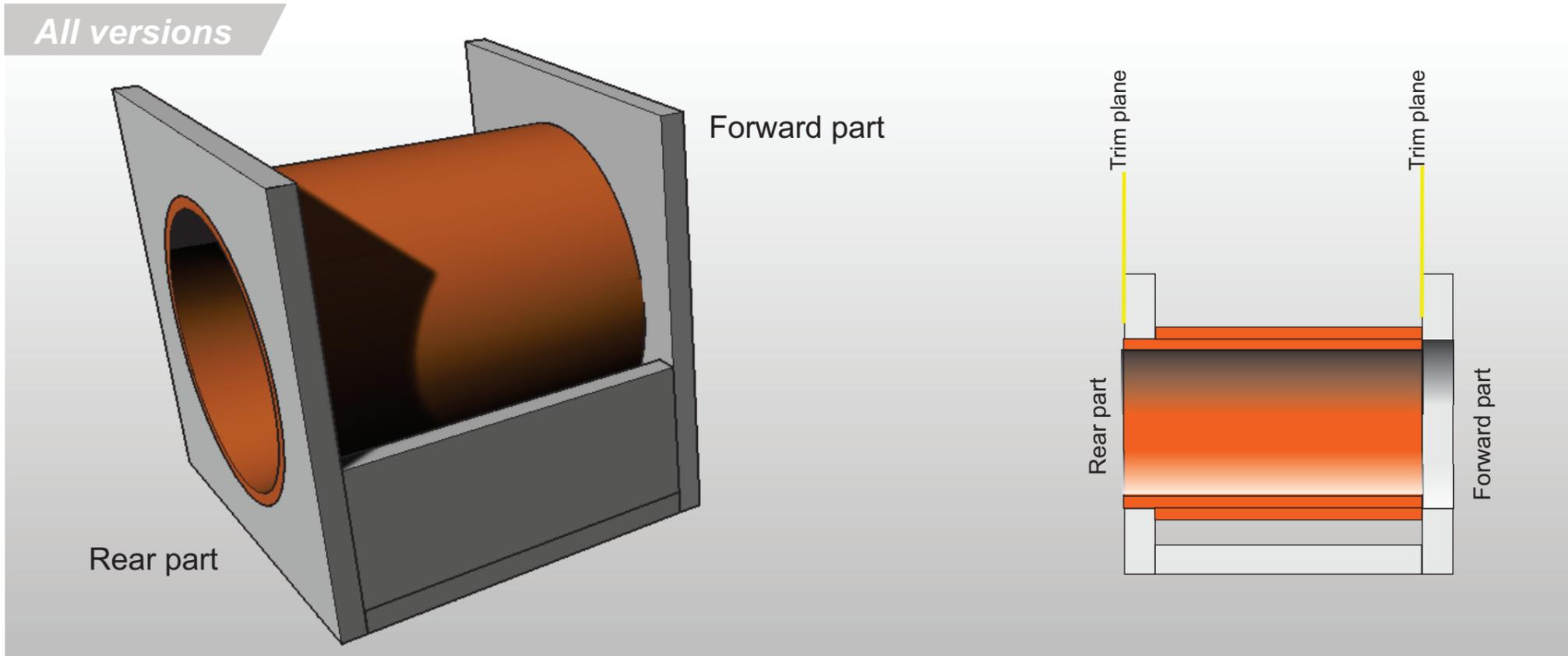
Within the rear and forward parts of the jig form the outer Nacelle 'tube' and epoxy to the inner tube. ensure that the joints are on opposite sides like this diagram below.



All versions



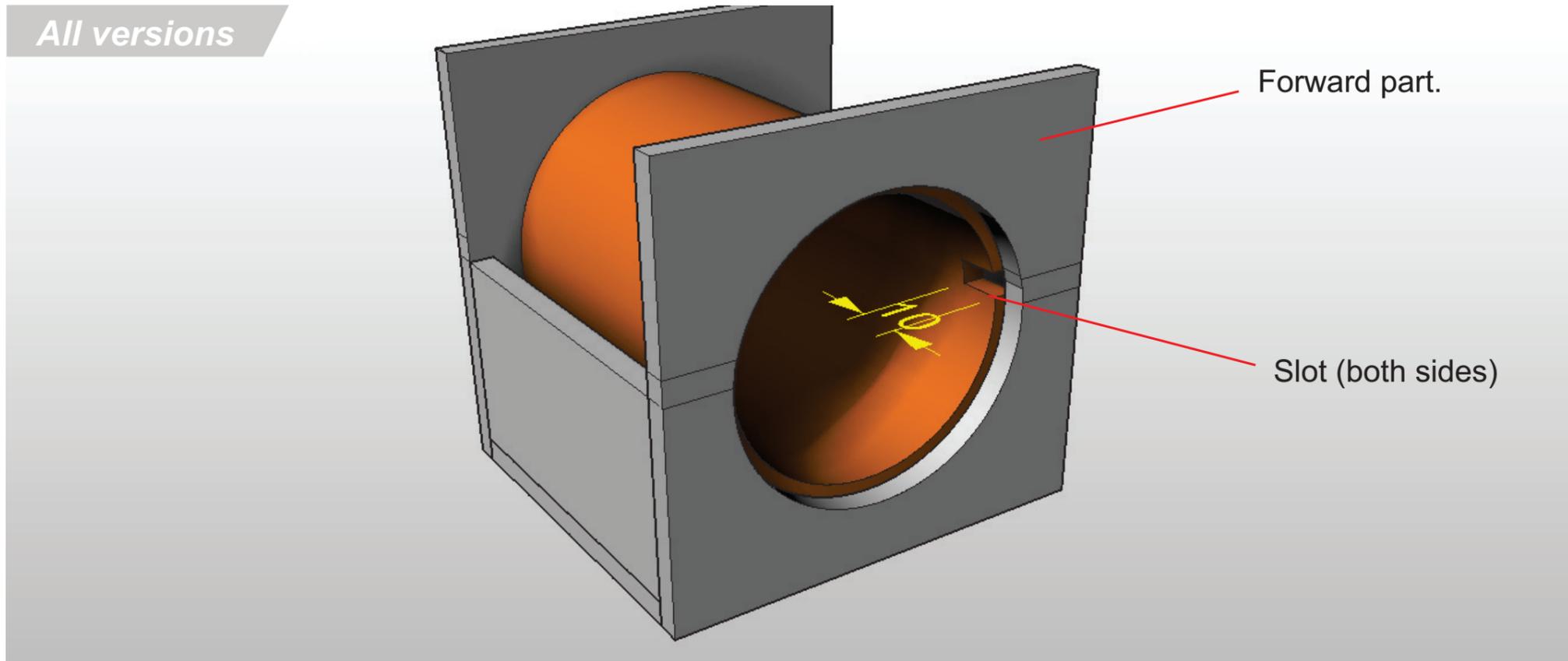
All versions



Trim the Forward Nacelle parts as shown using a retractable craft knife.

The rear edge of the nacelle should have a step in it, the forward part cut equally.

All versions



Before you break out the part from the jig, use the marks on the forward jig part and trim out some slots, 10mm deep aligned with the markings.

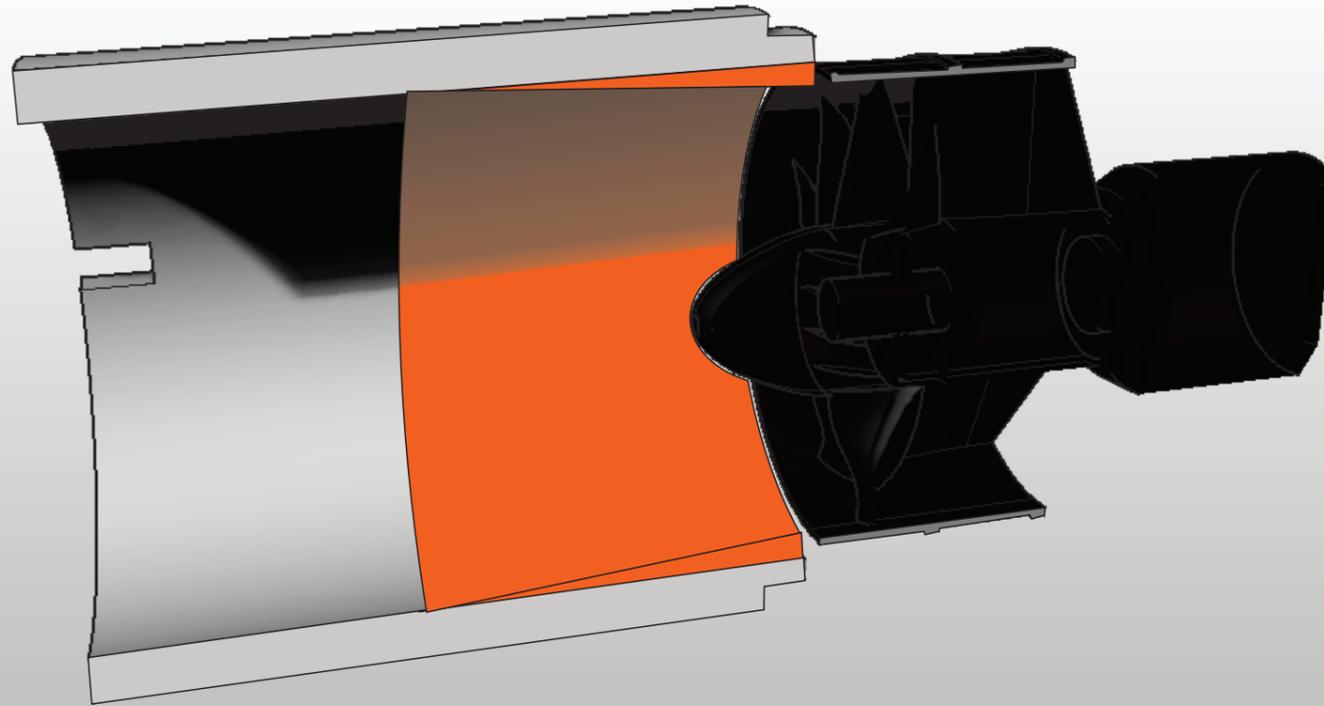
This is to position the nacelle correctly within the wing.

Mark the wing position intersection position down the sides of the nacelle.



EDF only

Section through 64mm EDF & Nacelle



64mm EDF only.

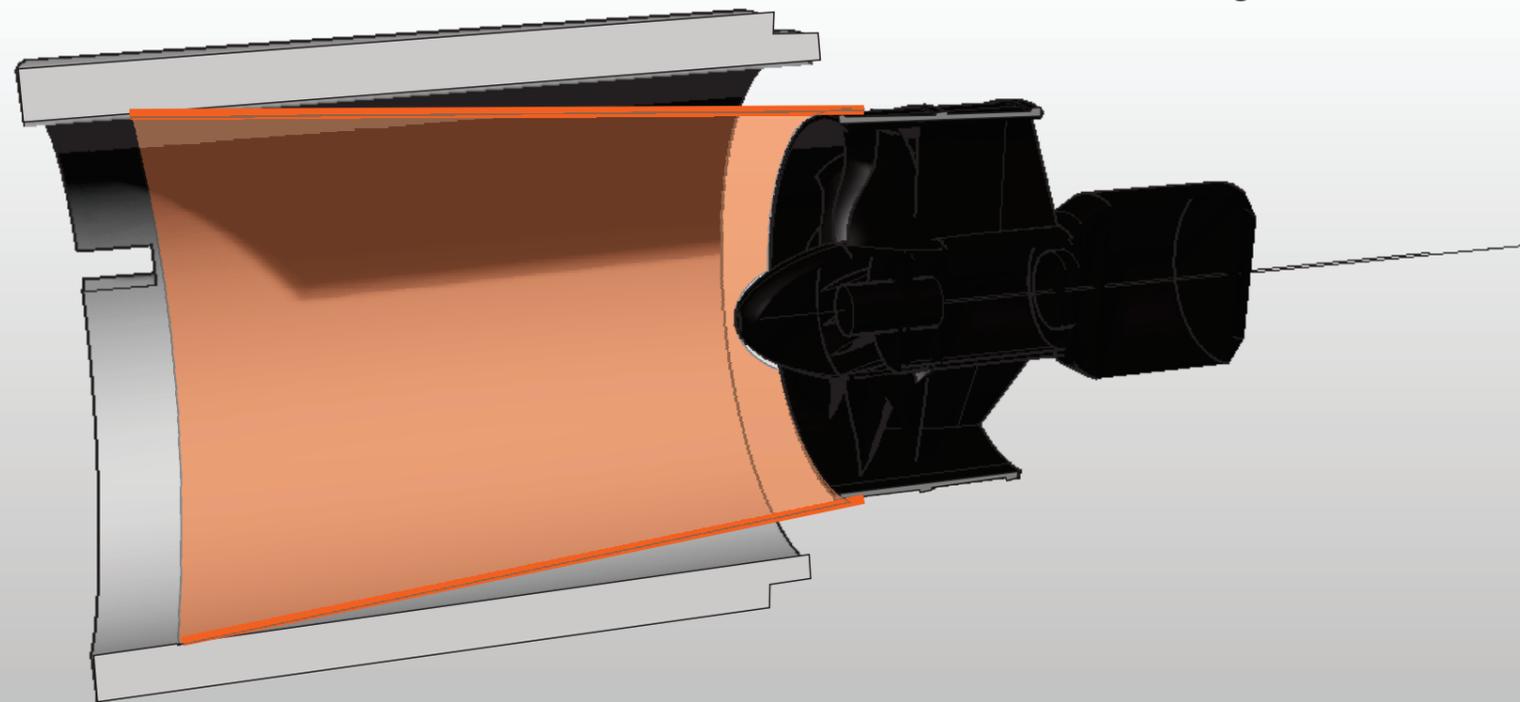
Make a strip of 3mm foam, and sand it to a feathered edge along one long edge.

Curve it, and trim it so it forms a conical air intake for the 64mm EDF unit.

Glue to the inside of the nacelle using epoxy.

EDF only

Section through 50mm EDF & Nacelle



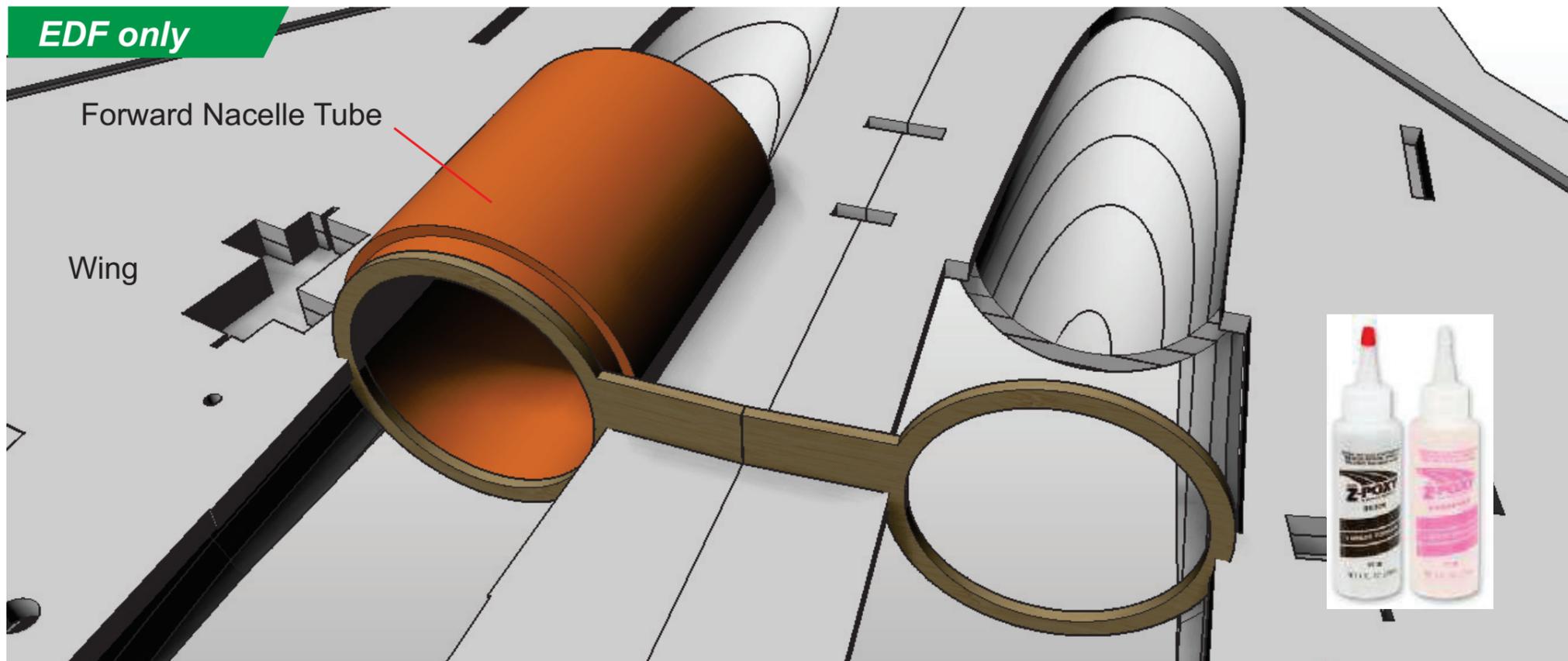
50mm EDF only.

Template from paper, then make a cone of 0.4mm plastic sheet as shown. Use nylon reinforced tape to fit to the nacelle and EDF leading edge.

You may wish to simply tack in place until the EDF is mounted then fully tape it permanently.



EDF only



Forward Nacelle Tube

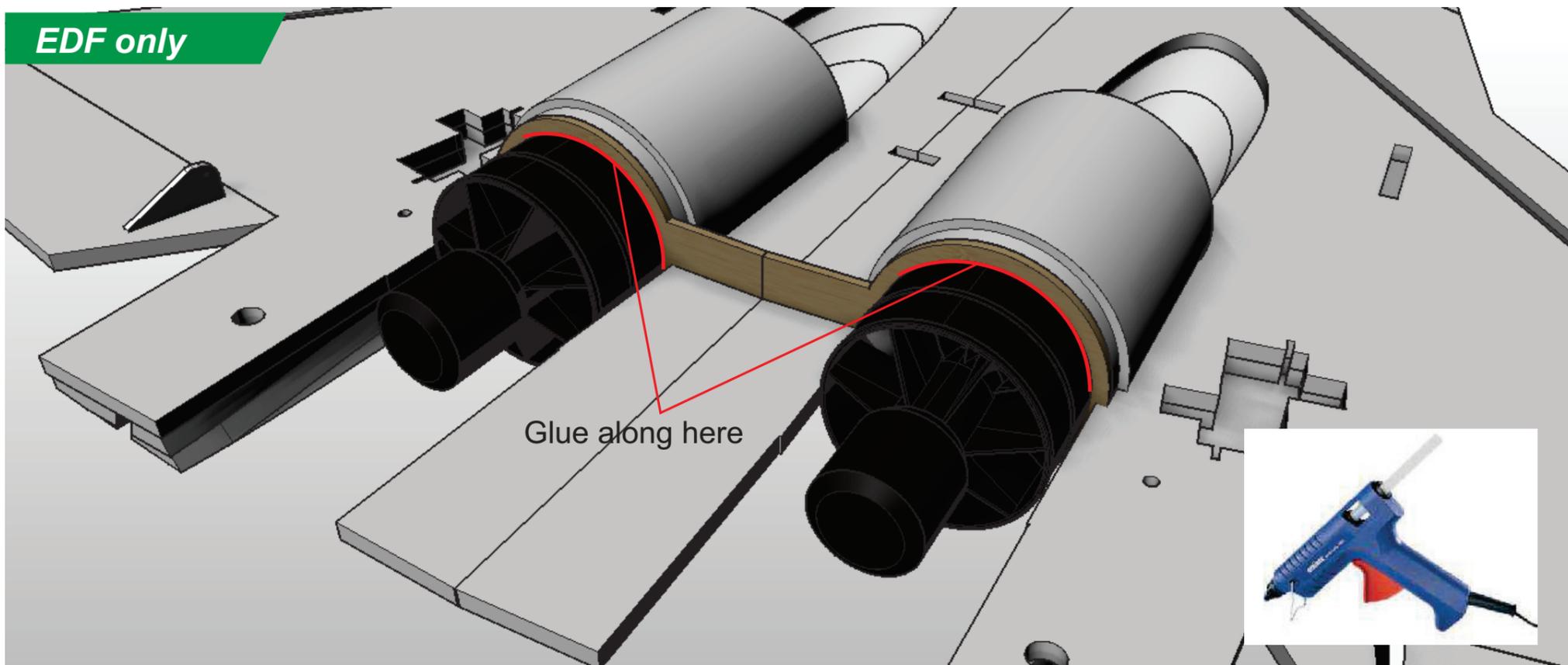
Wing

Ensure that the nacelle sits into the wing aligned to the wing. If it doesn't, sand the wing a little to help it to fit.

Cut out the 3mm liteply EDF supports and glue the edge to the wing according to the markings on the plans. Use Epoxy.

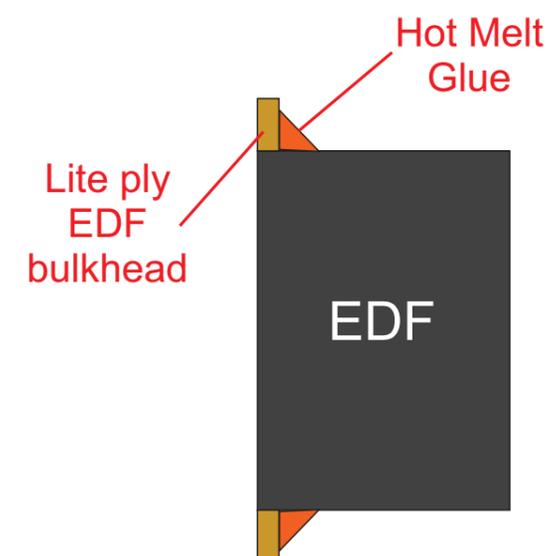
Make sure the nacelle is a good fit, then apply epoxy sparingly - pinning in place until the epoxy has set.

EDF only

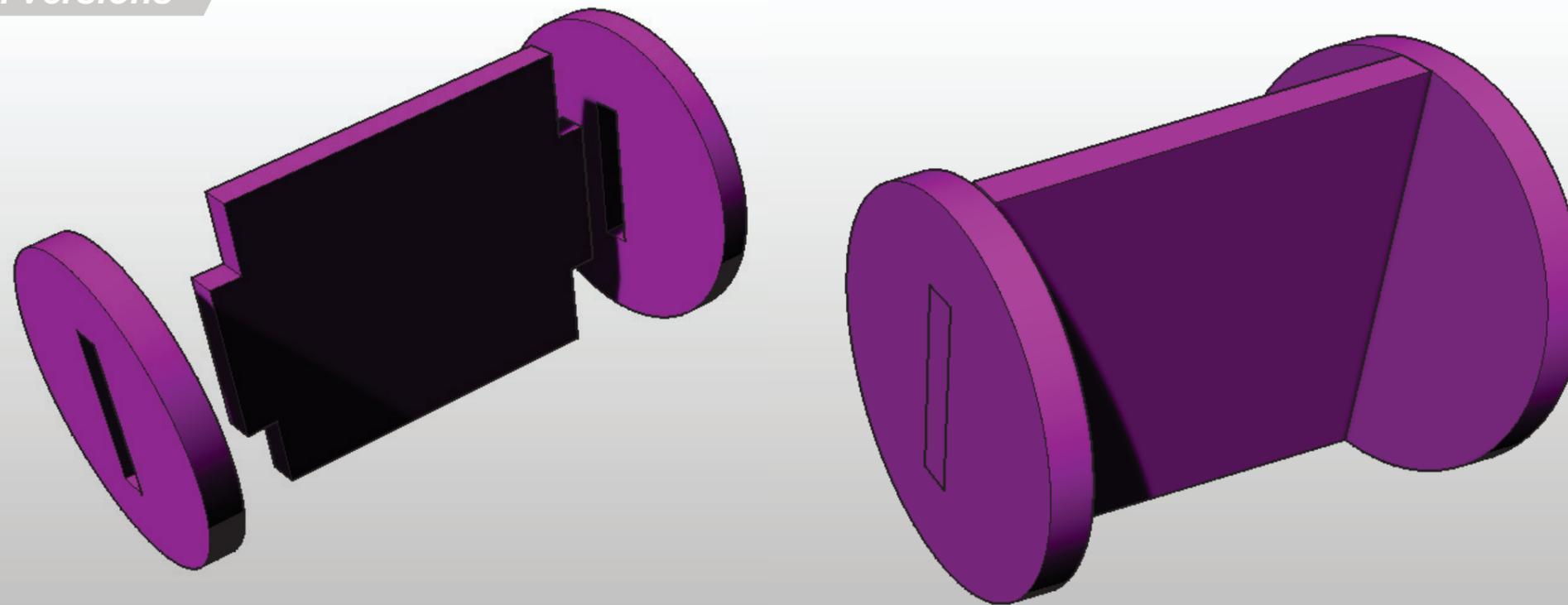


Glue along here

Offer the EDF's into the forward liteply support bulkheads. Ensure they fit well. Glue the EDF in place using hot melt glue.



All versions



REAR NACELLE JIG

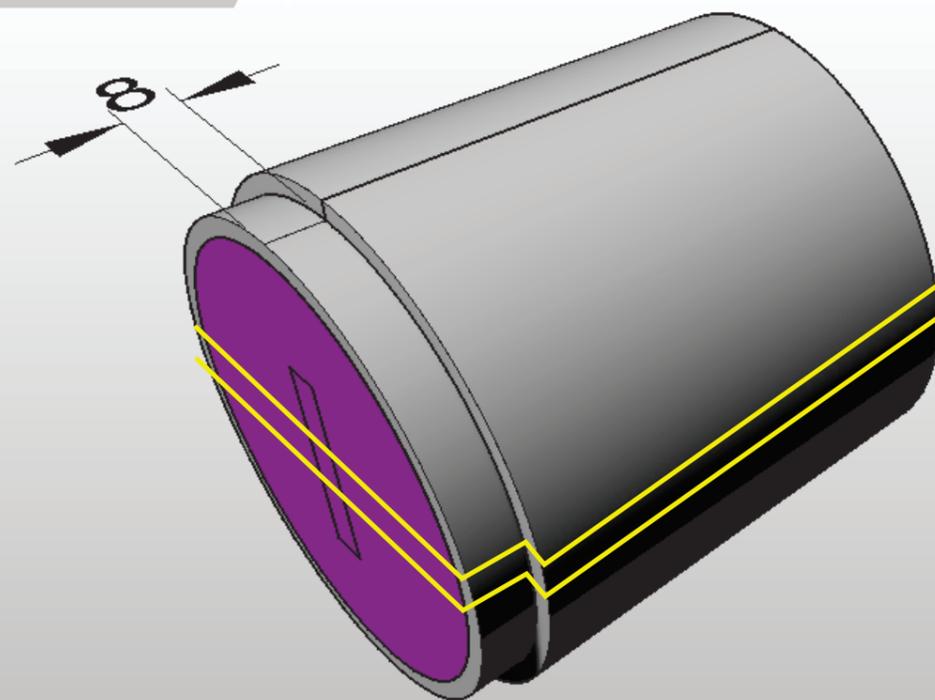
Glue the parts together.



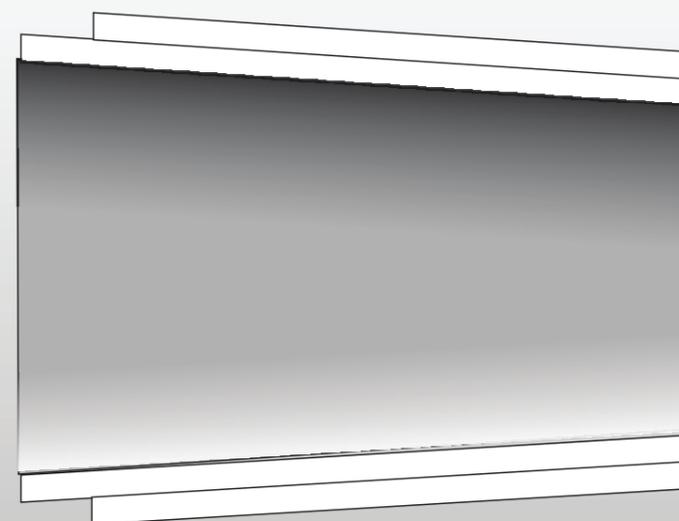
Create two rear Nacelle parts as shown rolling 3mm sheet foam into shape. Ensure the joints are on opposite sides.

Leave an 8mm flange.

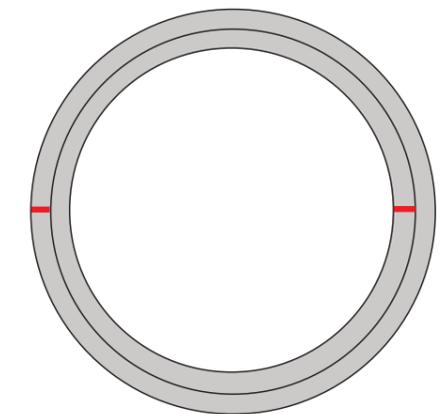
All versions



Forward



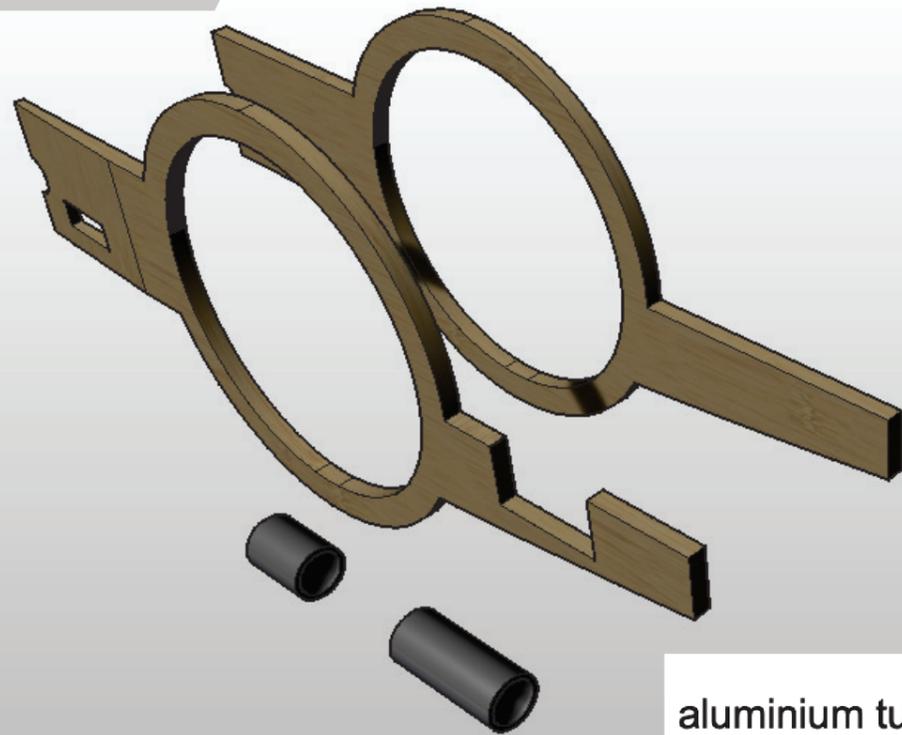
Rear



Mark the locating lines onto the nacelle by aligning a ruler with the markings on the circular jigs.



All versions



aluminium tubes 7.14 x .355mm (9/32 x .014")



Glue together the 3mm Lite ply Aft Bulkhead part as shown.

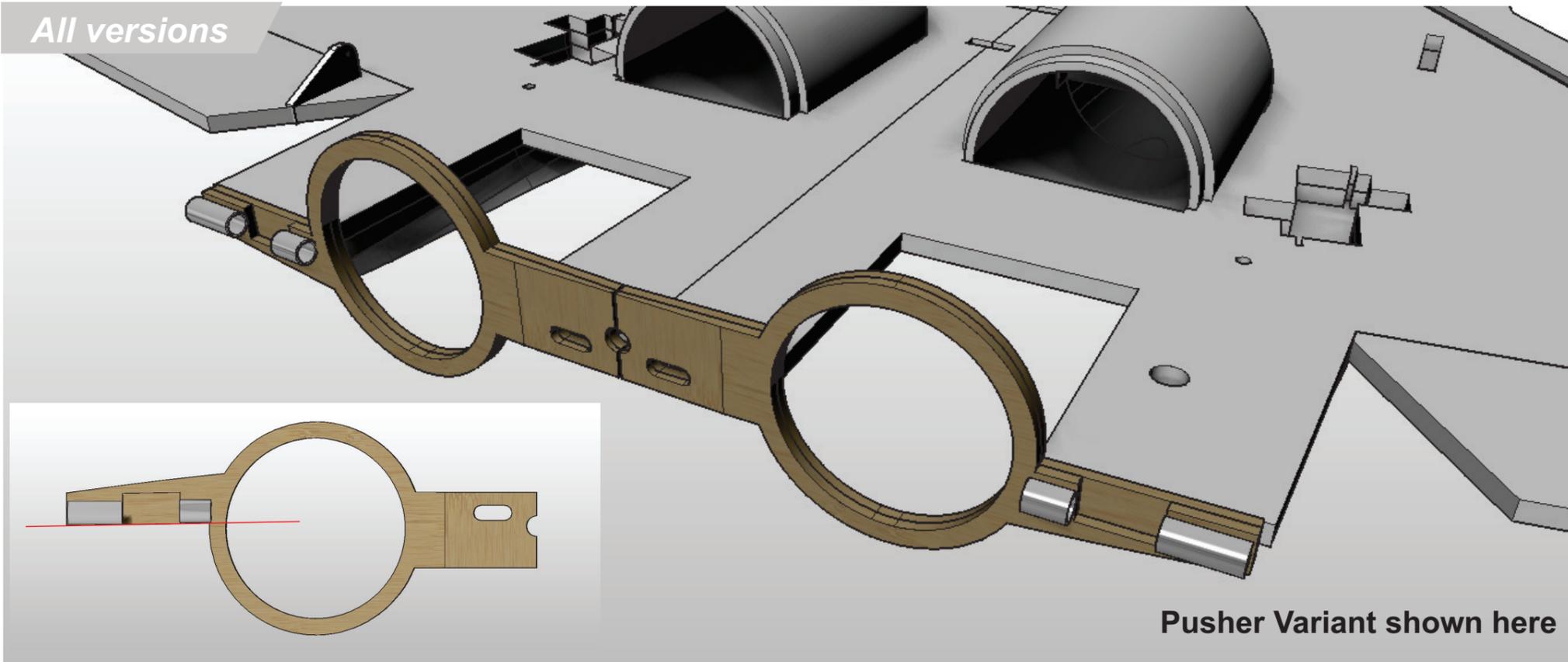
Using a 120grit sandpaper, rough the surface around the 10mm & 18mm aluminium tube pieces.

Using a piece of 6mm carbon tube slotted into both pieces of aluminium tubing, parallel to the straight edge. (see image bottom right). Then glue onto the assembly.

Once set, apply a little 0.6oz fibreglass to the tubes with epoxy to further reinforce them/

Glue both pieces to the fuselage using the indicated straight edge aligned to the wing as shown.

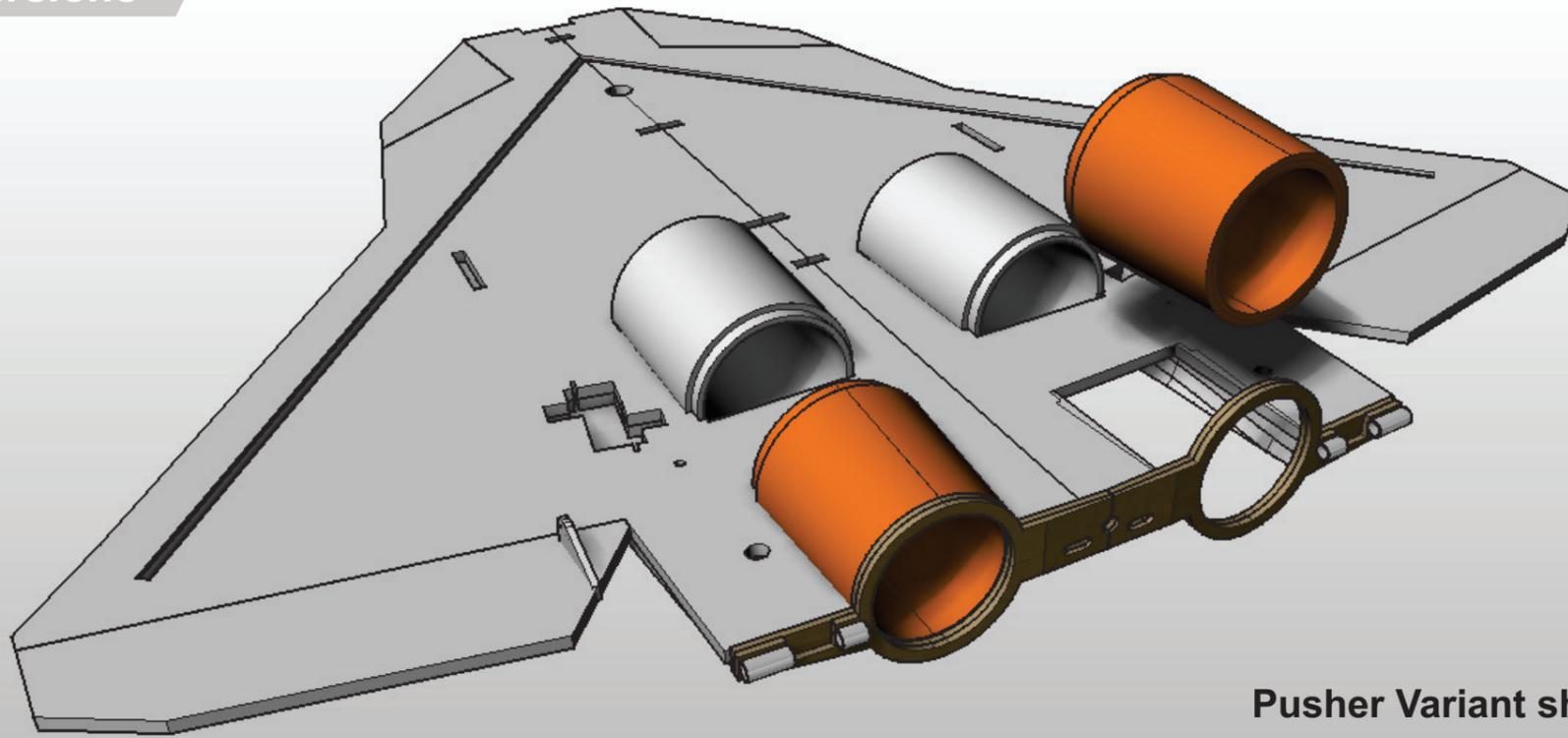
All versions



Pusher Variant shown here



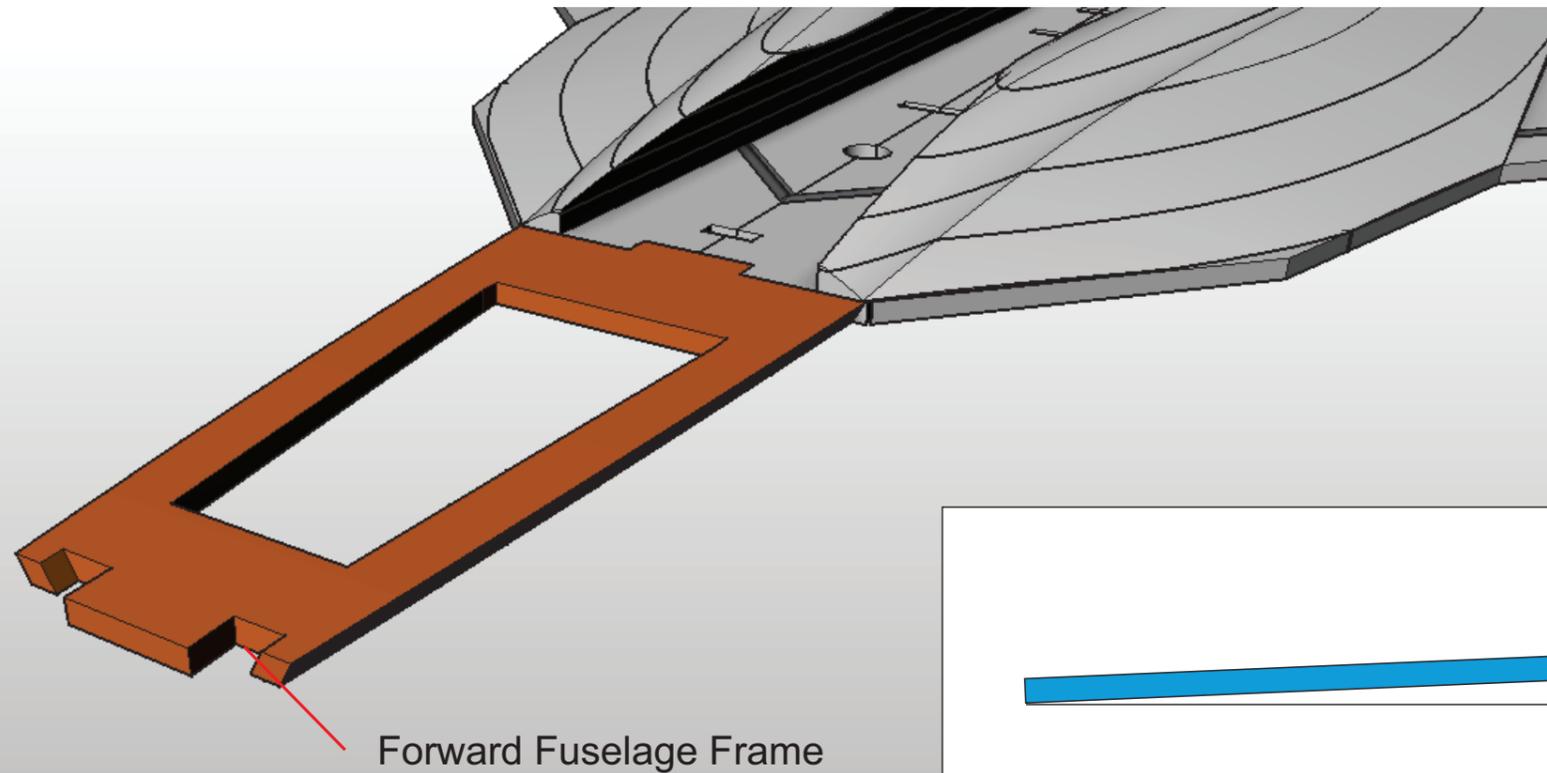
All versions



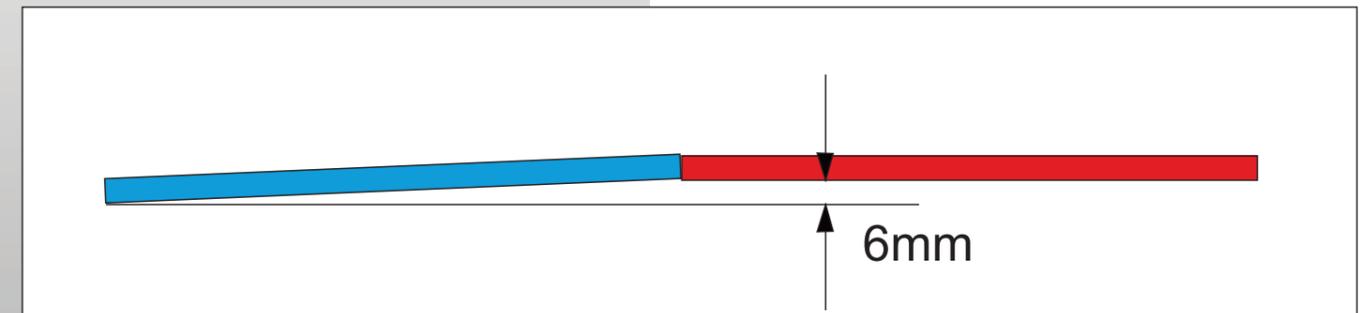
Pusher Variant shown here

In exactly the same way as the forward Nacelle parts, glue the rear parts to the airframe, using the drawn lines and the rear bulkhead as guides.

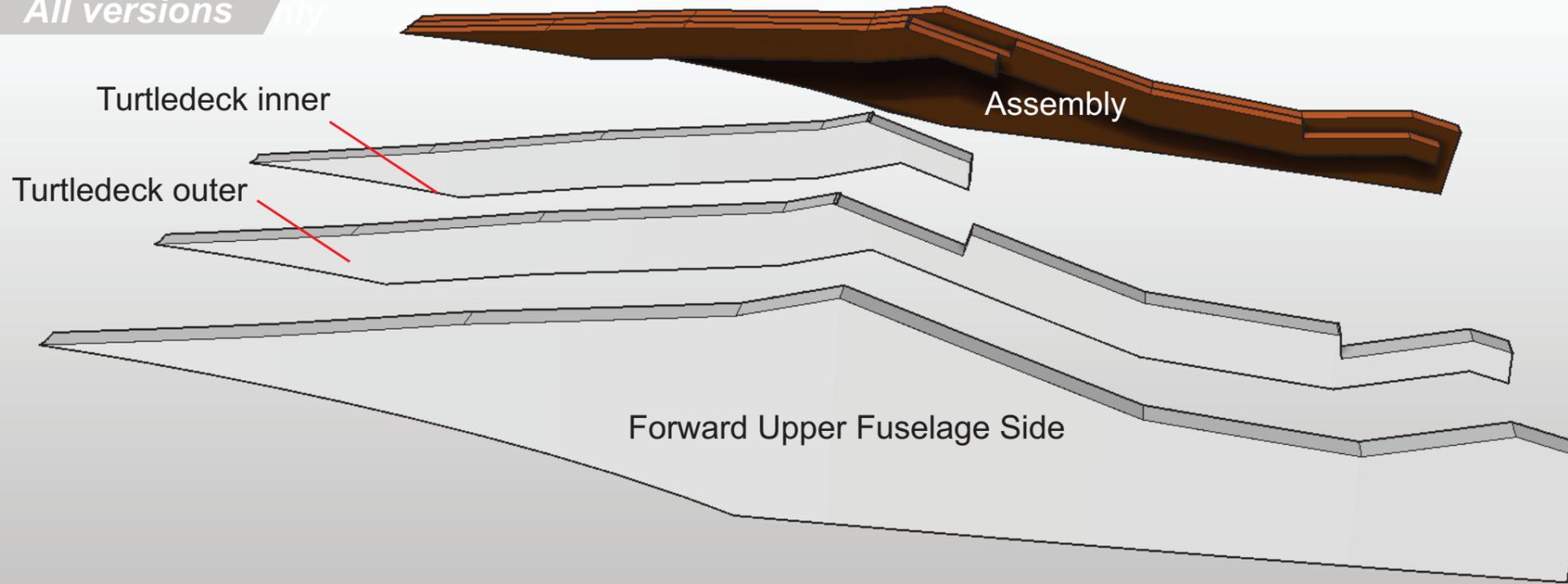
All versions



Glue the **Forward Fuselage Frame** to the assembly using epoxy glue. Angle the frame to the assembly 6mm lower than the wing as diagram below.



All versions only



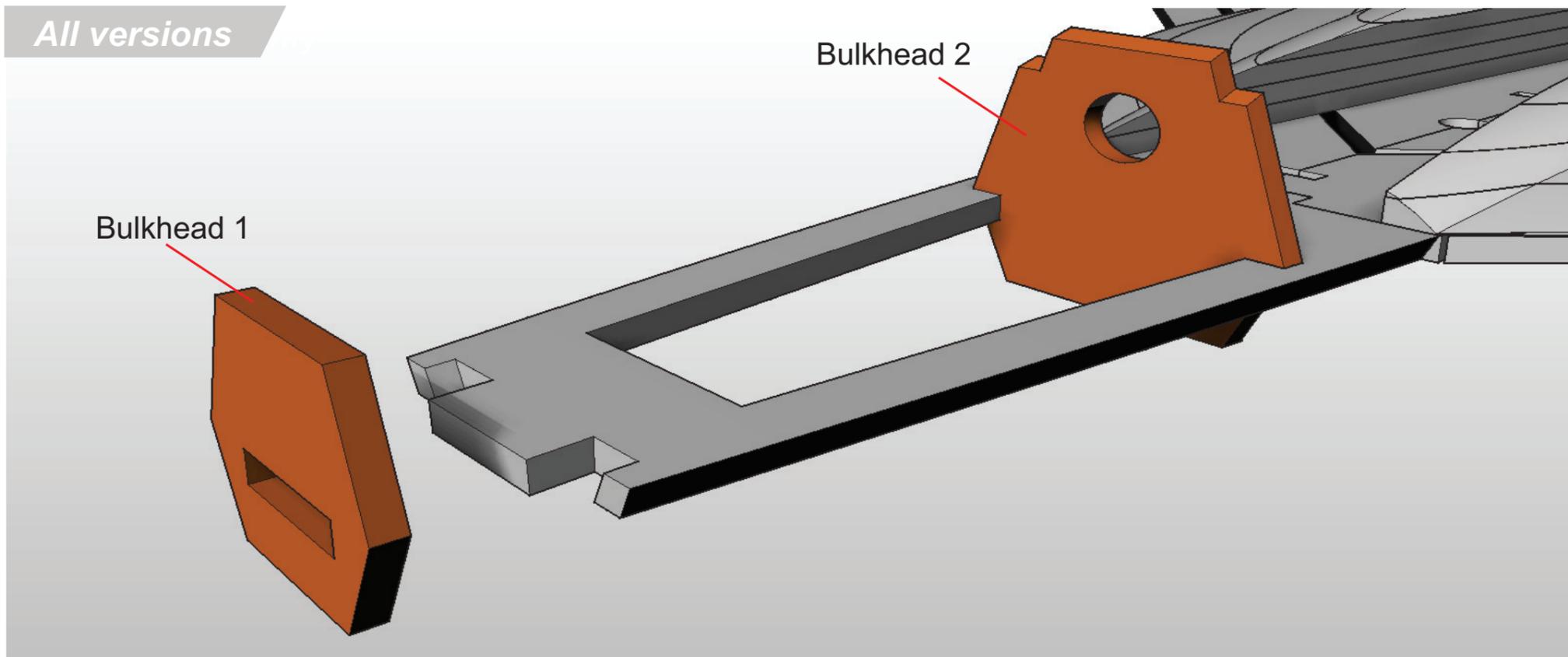
Create the two forward fuselage upper side assemblies as shown.

Glue the **Turtledeck inner** to the **Turtledeck outer**.

Glue the Turtledeck parts to the **Forward Upper fuselage side**.



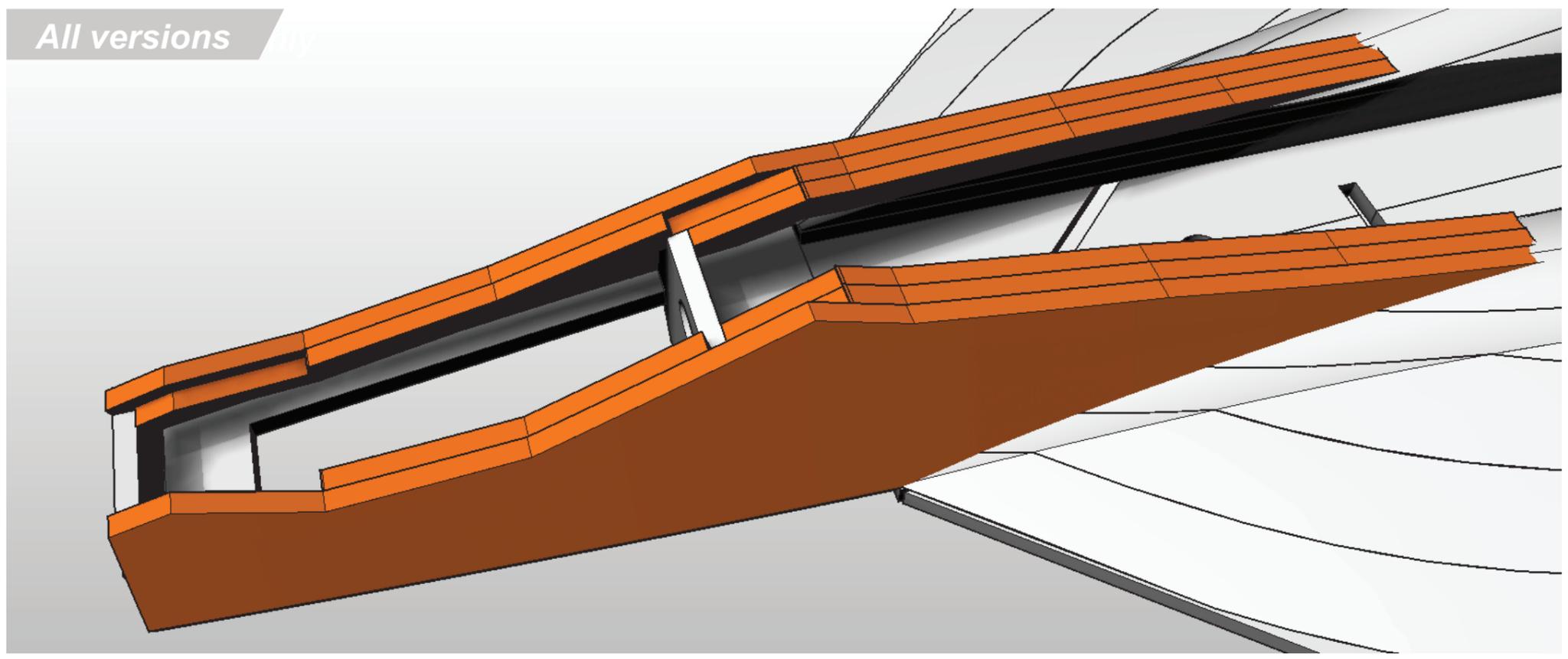
All versions only



Glue **Bulkhead 1** and **Bulkhead 2** in place.



All versions *only*



Glue the two forward fuselage upper side assemblies to the fuselage. Sand the mating faces to ensure a good fit.

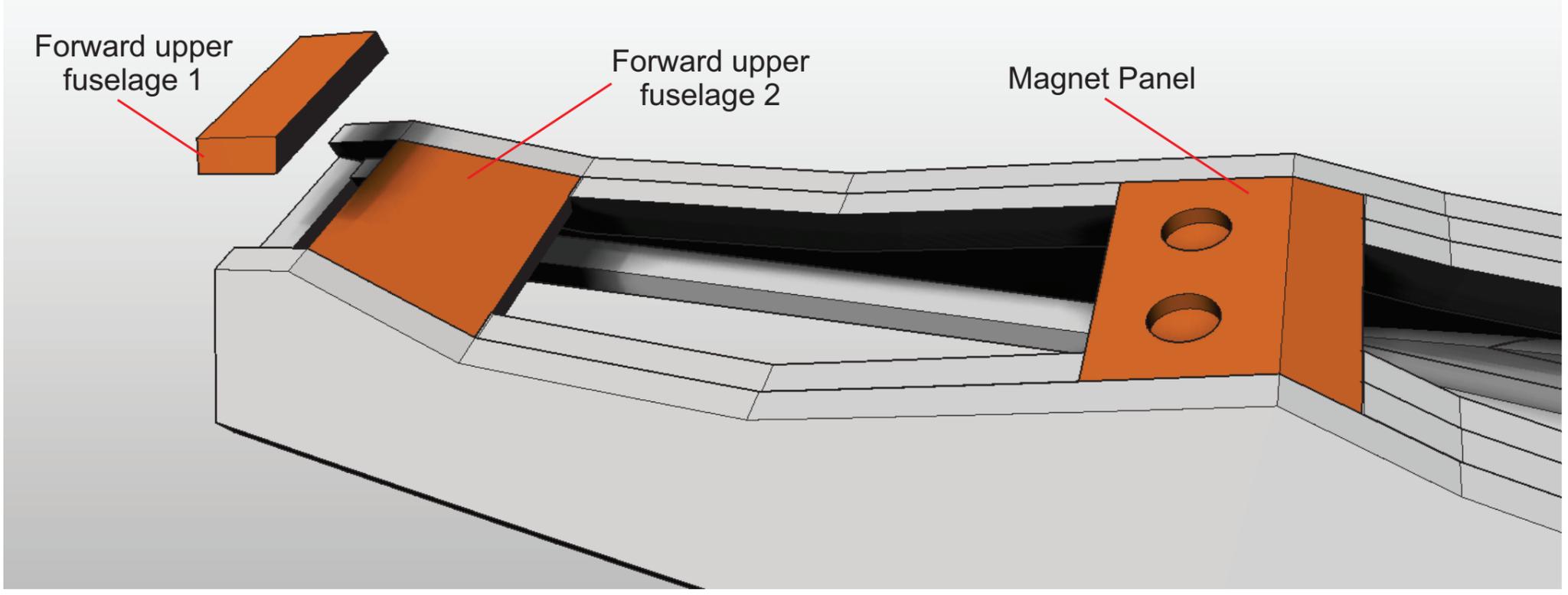


All versions *only*

Forward upper fuselage 1

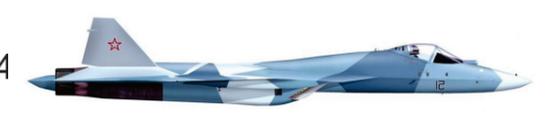
Forward upper fuselage 2

Magnet Panel

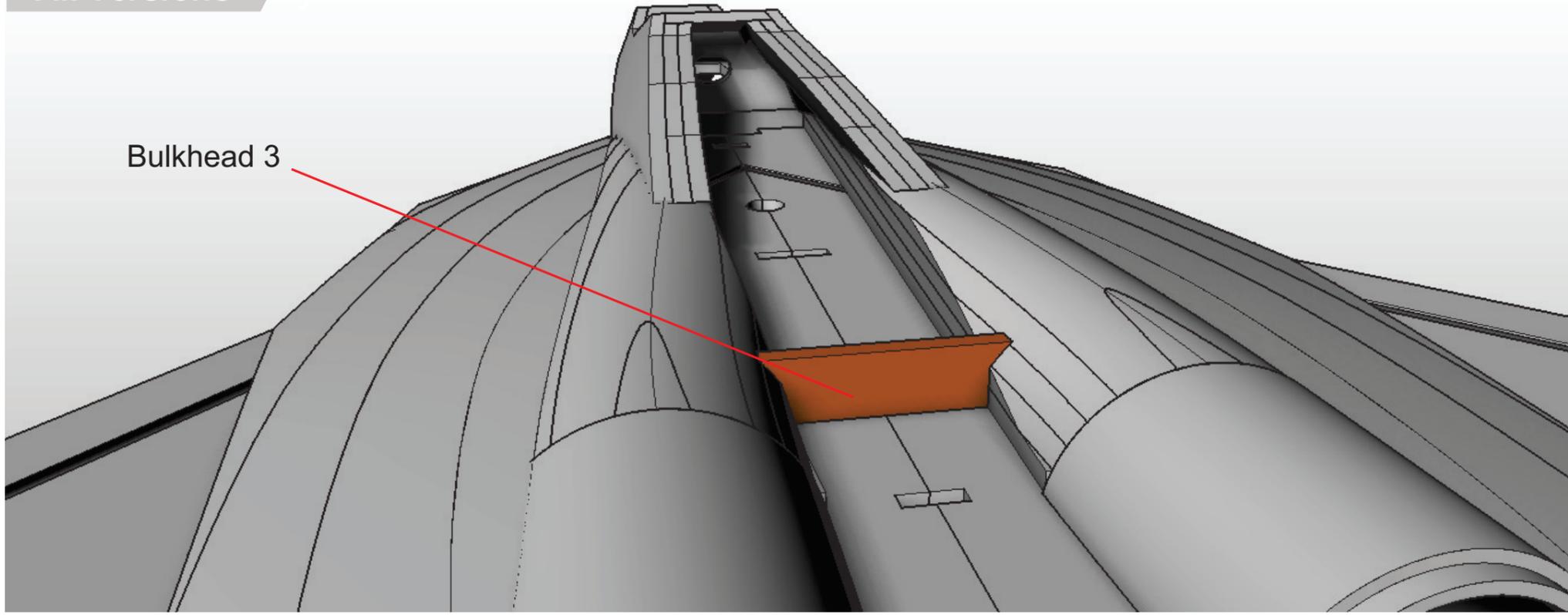


Glue the **Forward Upper Fuselage 1 & 2**, and the **Magnet panel** in place.

You will need to flex the fuselage side assemblies out a little to get them to fit.



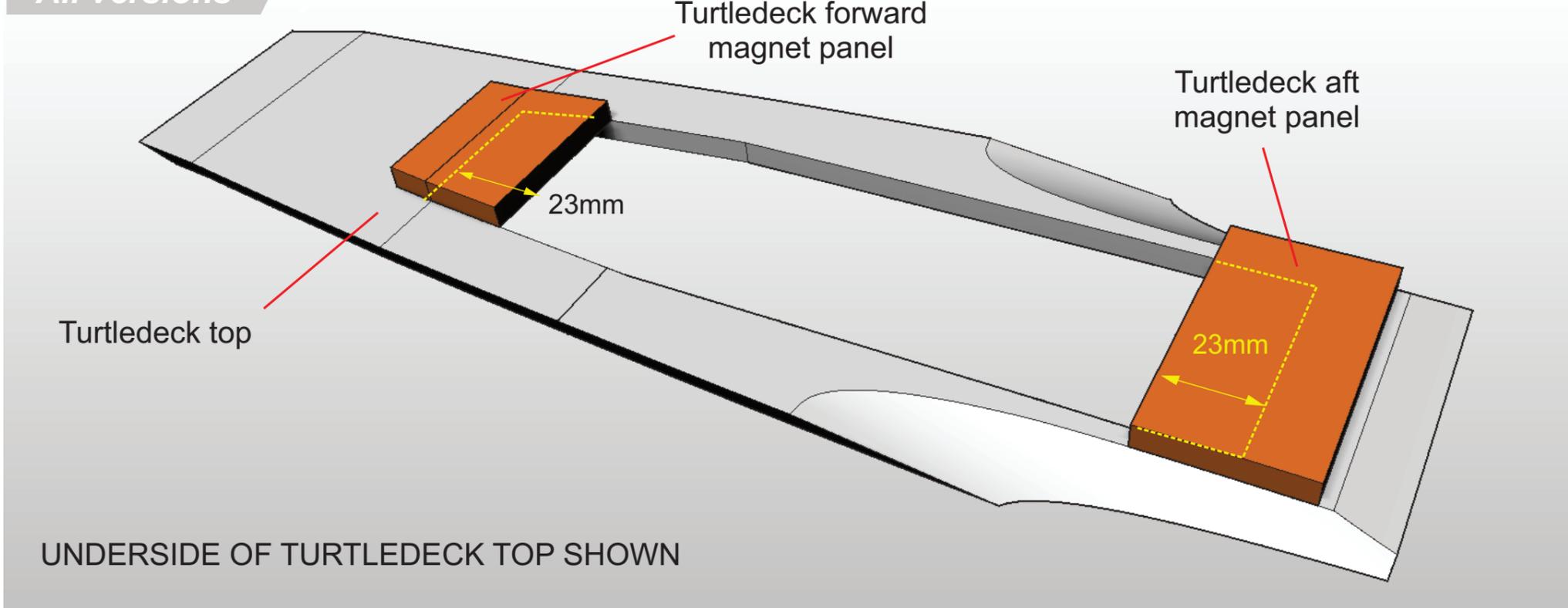
All versions



Glue **Bulkhead 3** in place.



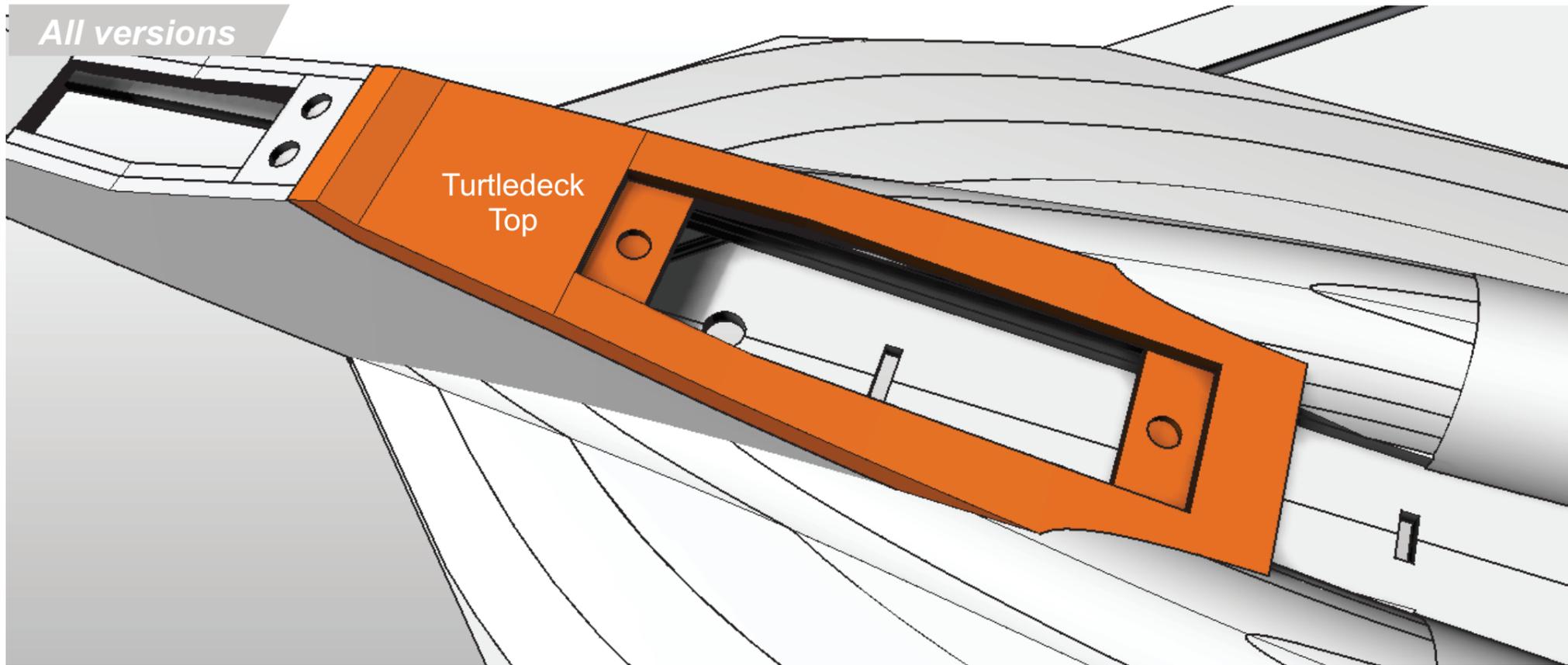
All versions



Glue the two magnet panels in place - leaving 23mm of flange showing to fit the magnets in.



All versions

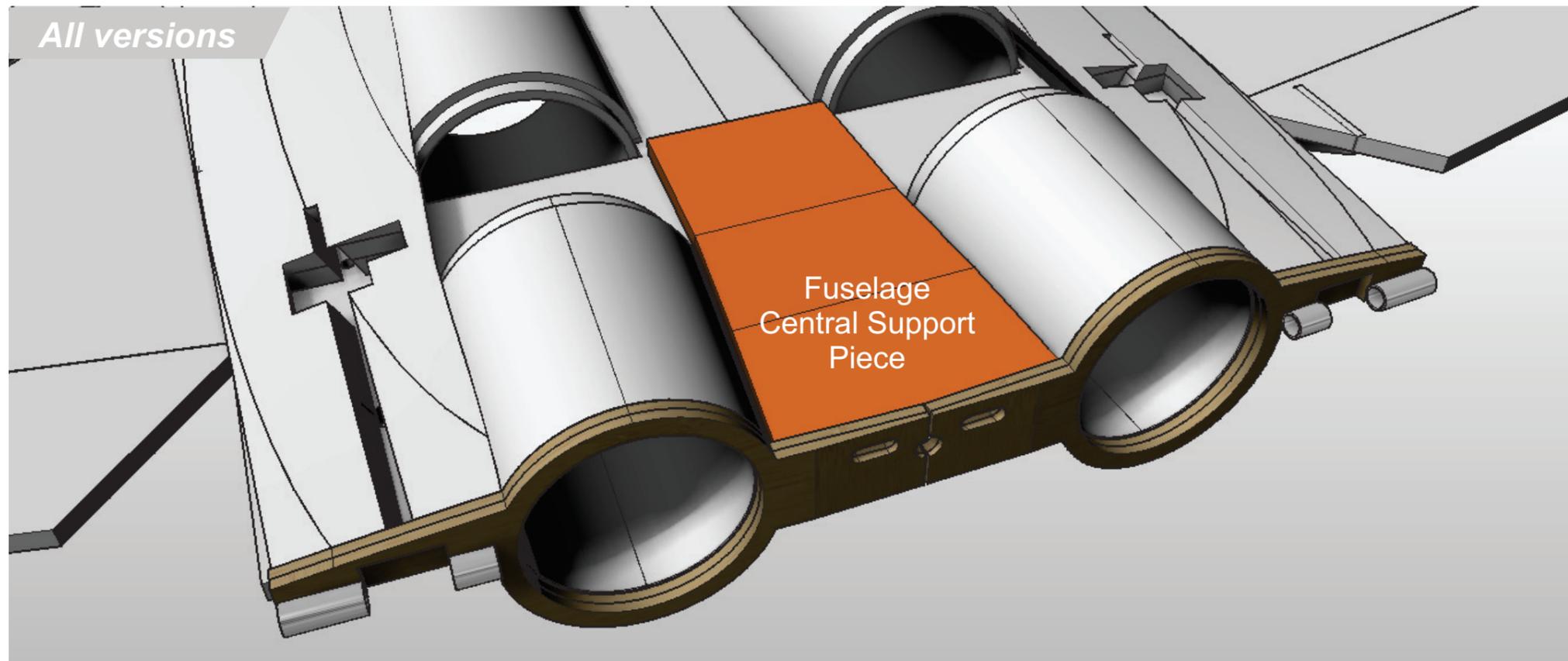


Crease and 'crush bend' the Turtledeck top assembly to get the shape near the canopy.

Sand to get a good fit, then glue in place



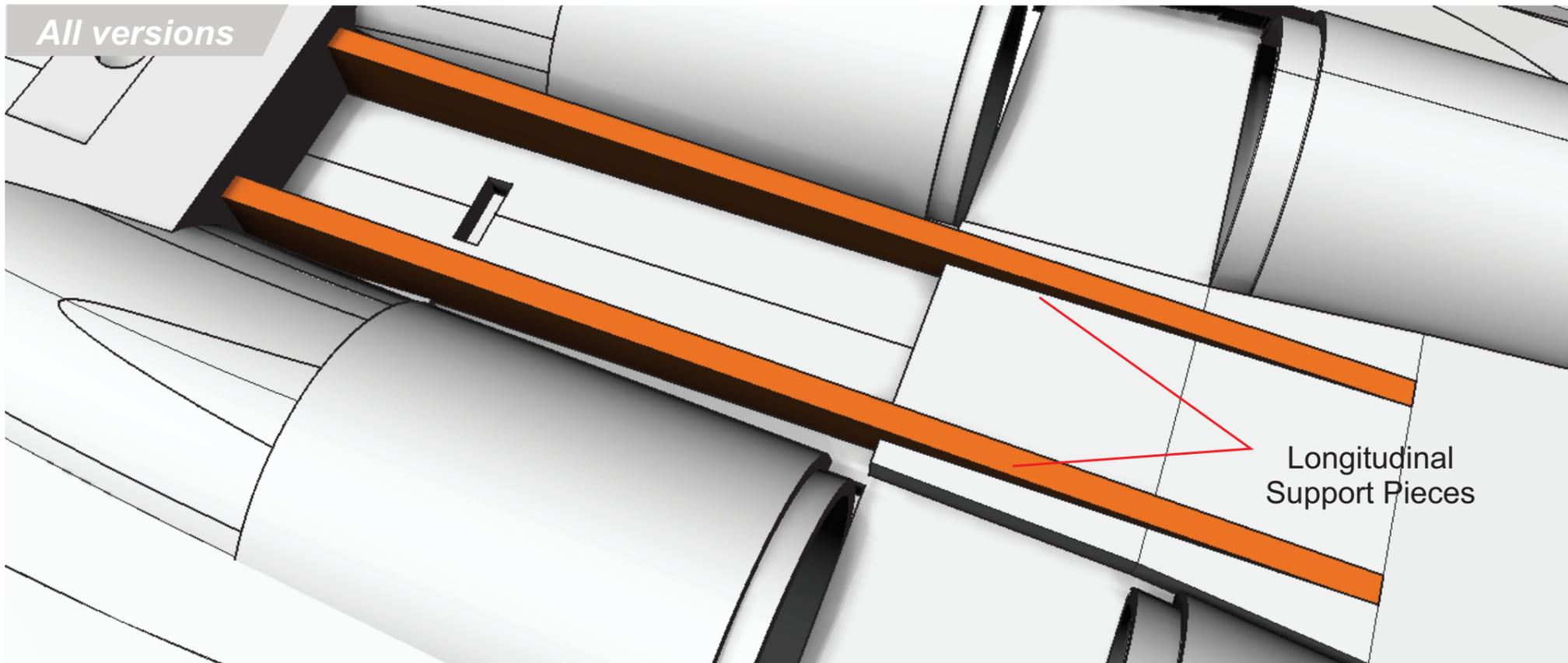
All versions



Sand the **Fuselage Central Support piece** to give a good fit, then glue in place.



All versions

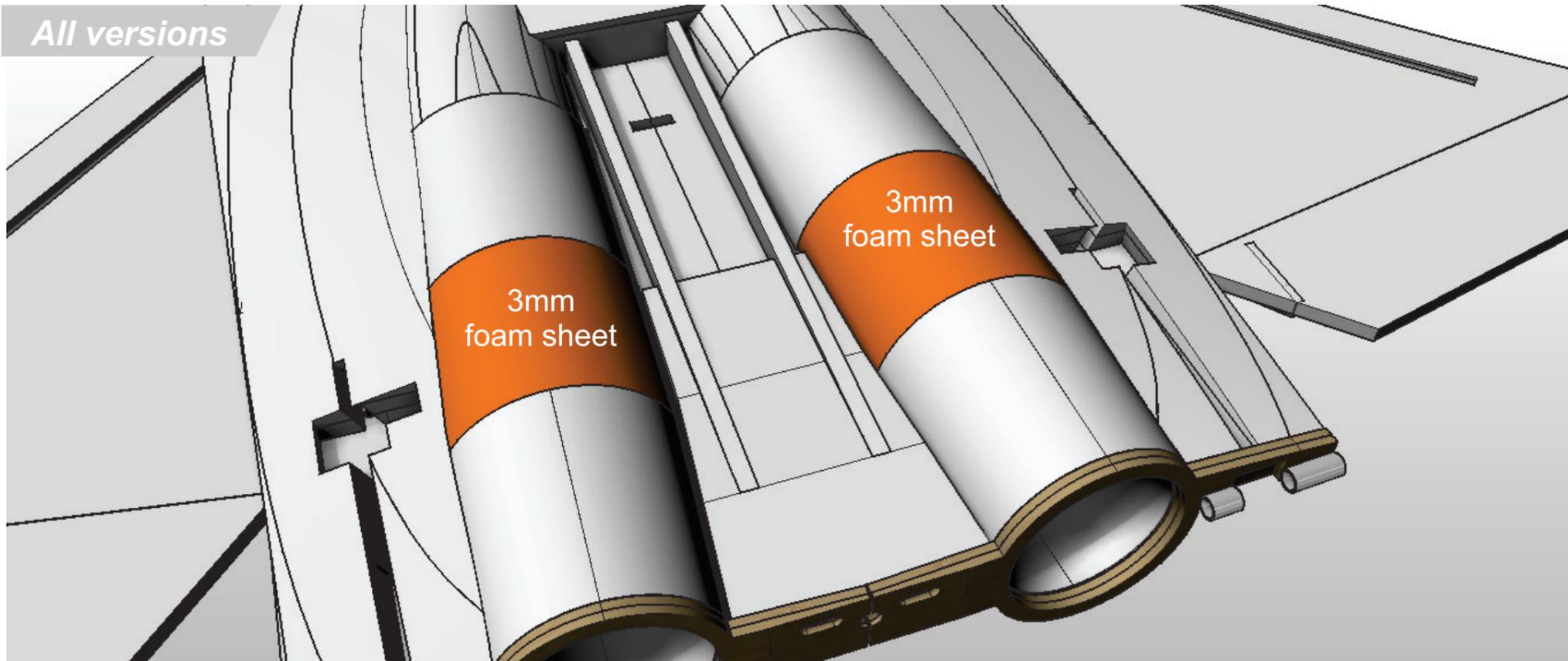


Glue the **Longitudinal support** pieces in place as shown.

They are positioned parallel to centreline as far outboard as possible.



All versions



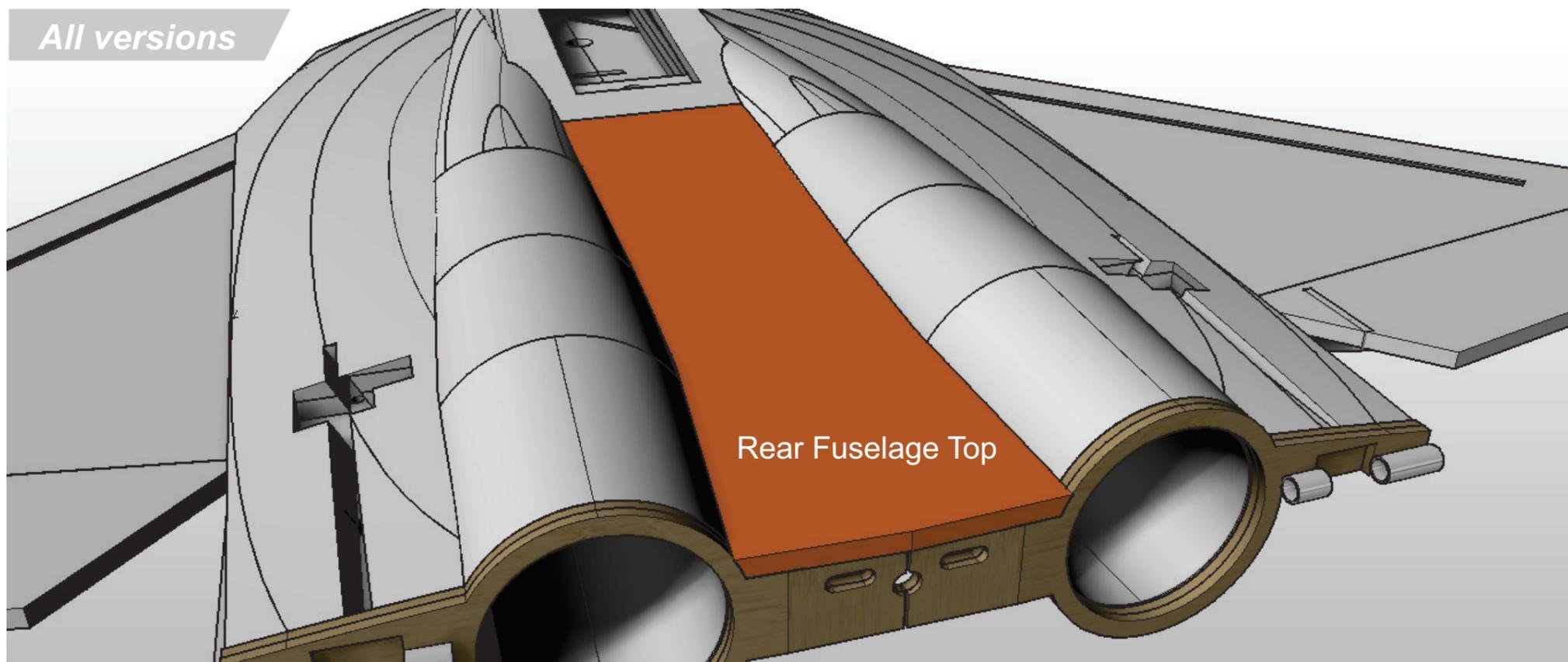
PUSHER ONLY

Cut and bend some 3mm foam sheet to fit neatly on the flanges of the nacelle tubes and glue in place.

For the EDF versions, this needs to be left off for access to fit the EDF units.



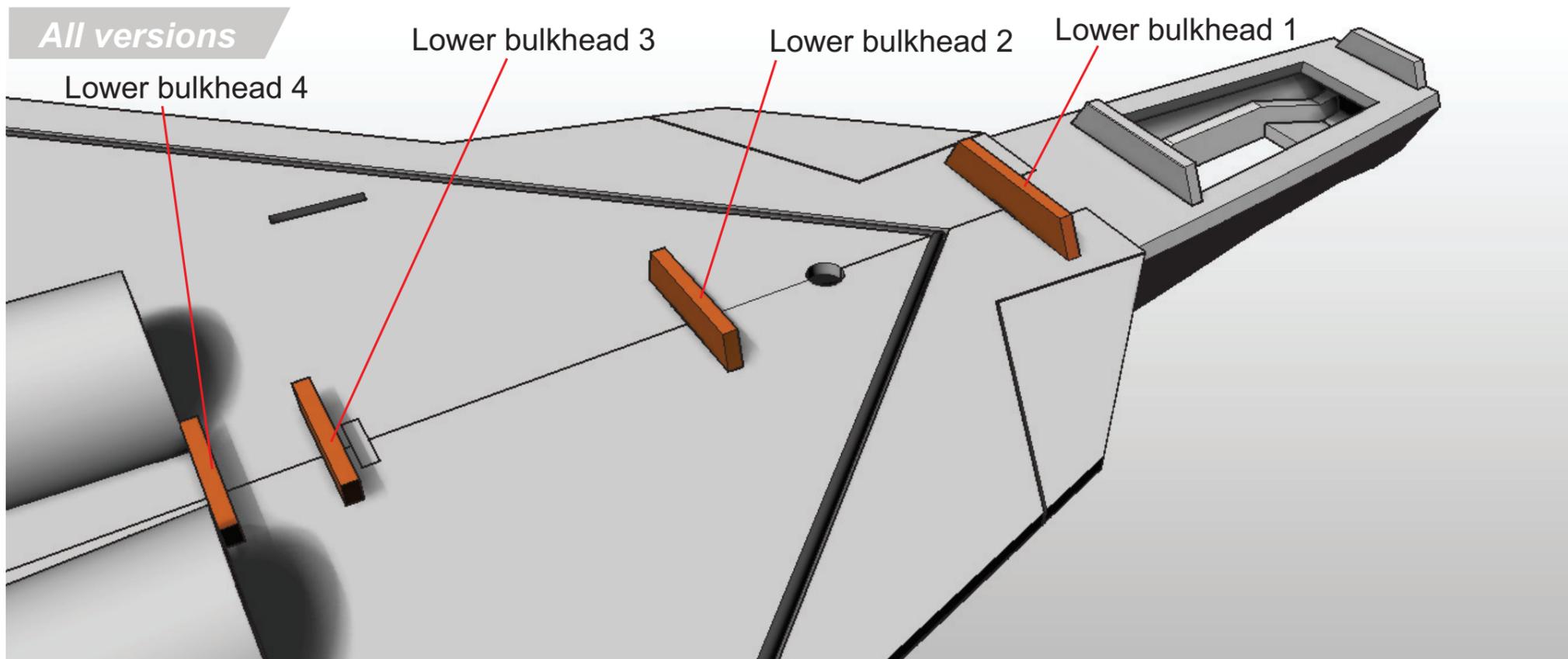
All versions



Glue the **Rear Fuselage Top** to the fuselage.

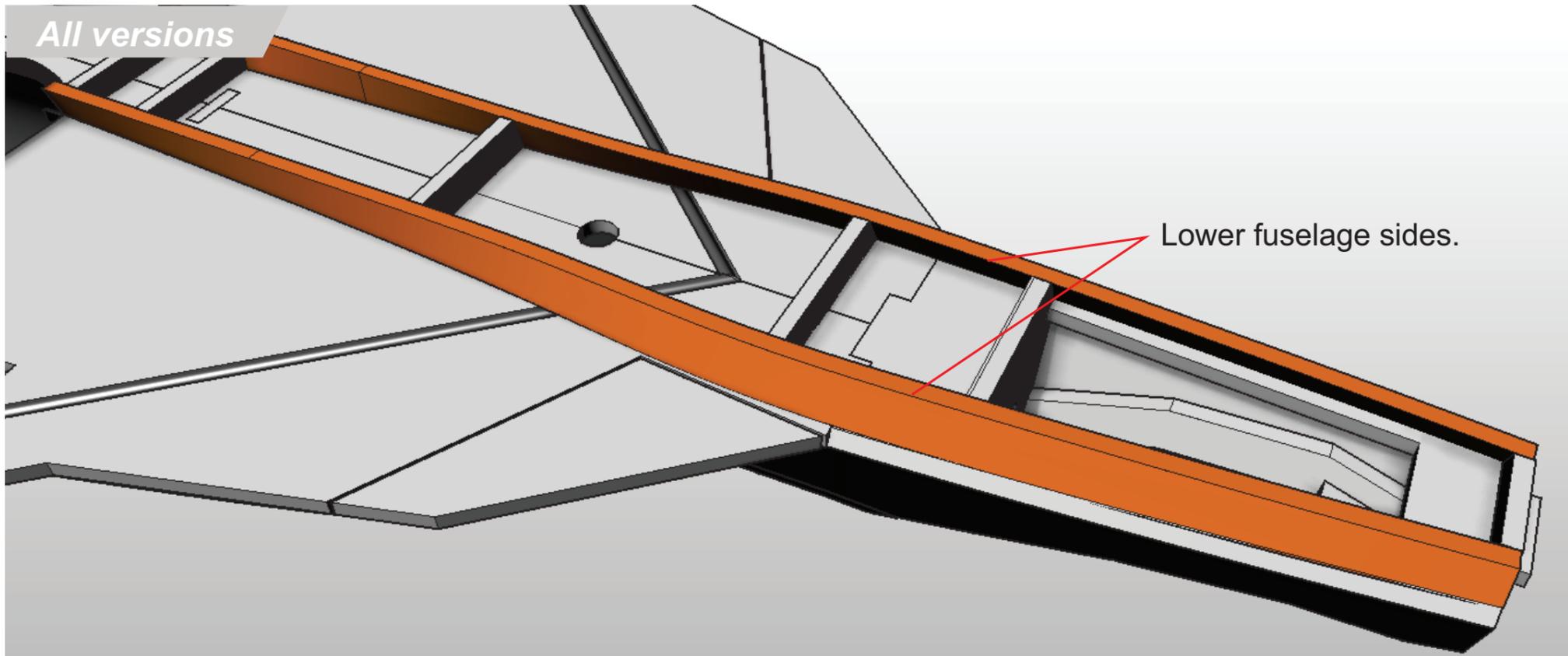


All versions



Glue the lower bulkheads in place.

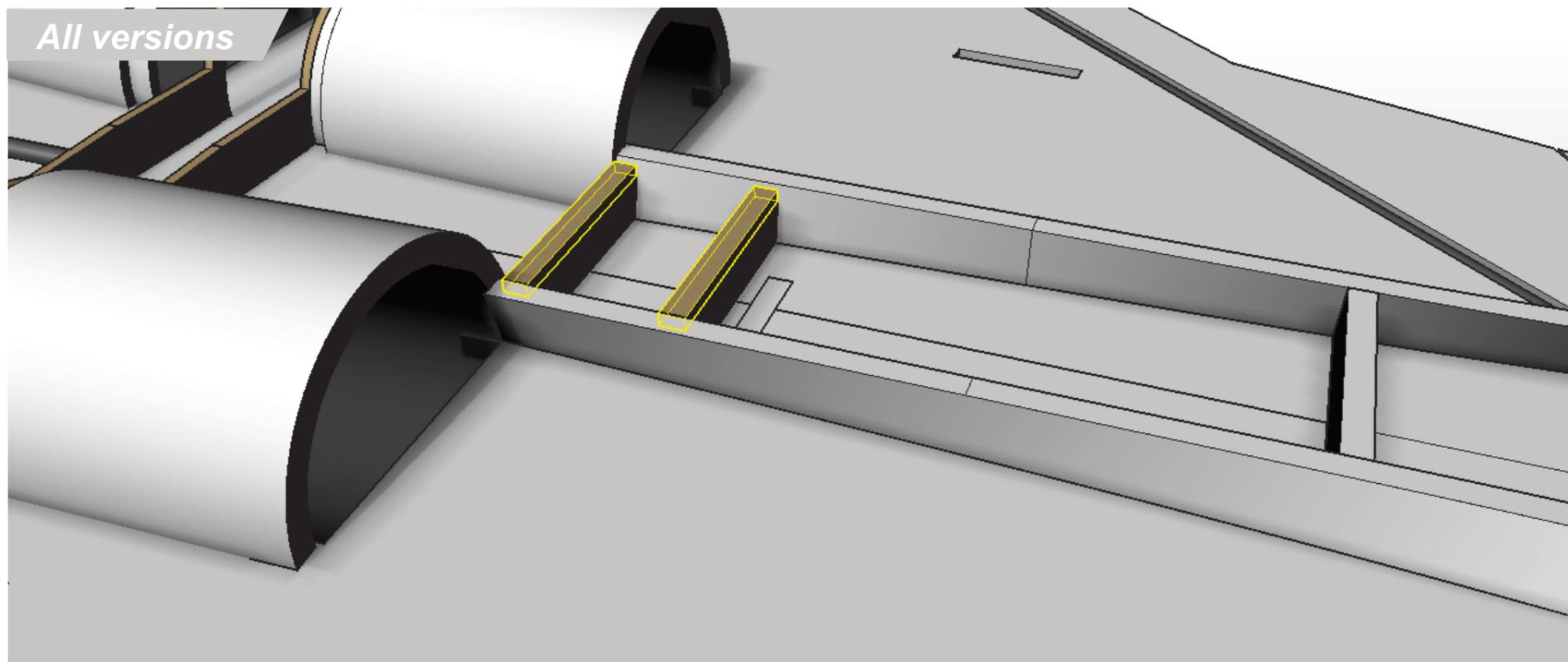




Glue the **Lower Fuselage sides** to the fuselage.

Please note that the sides twist and may require additional sanding to shape.

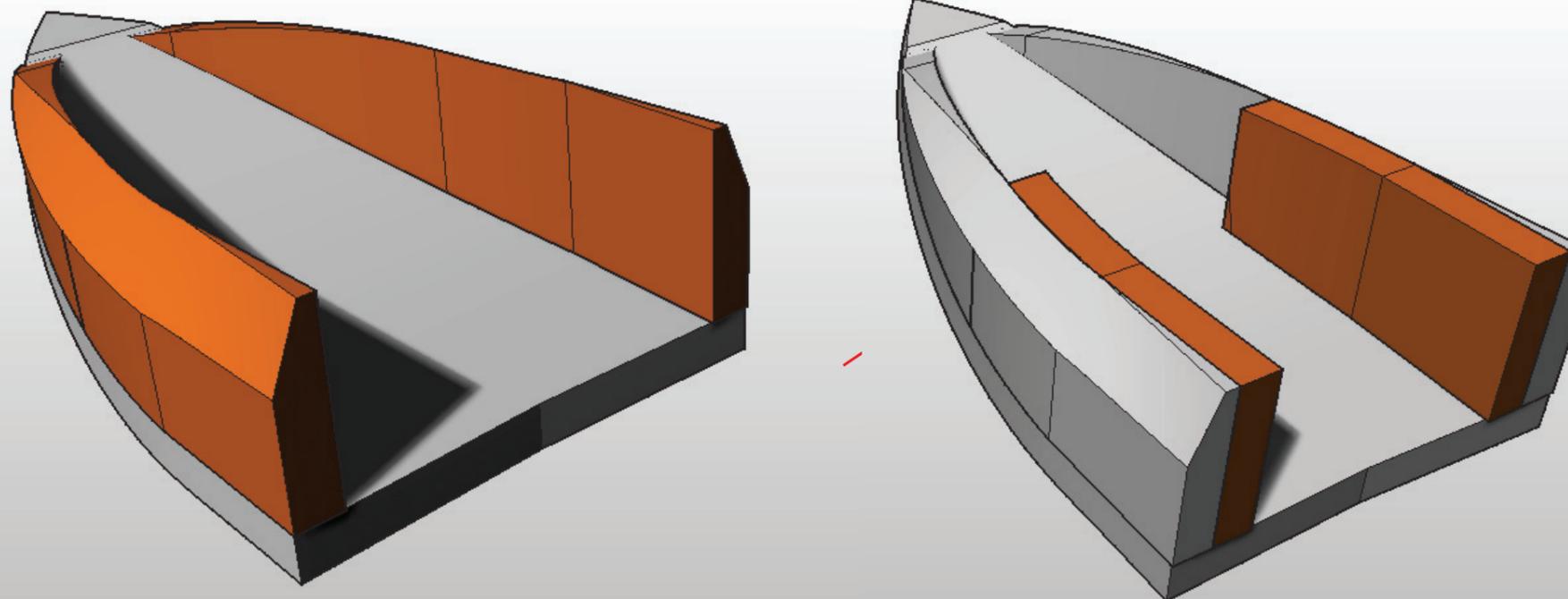
also note : The rear two lower bulkheads are deliberately lower.



Glue two coffee stirrers to the rear two bulkheads - this is to insulate the foam from a hot speed controller.



EDF only

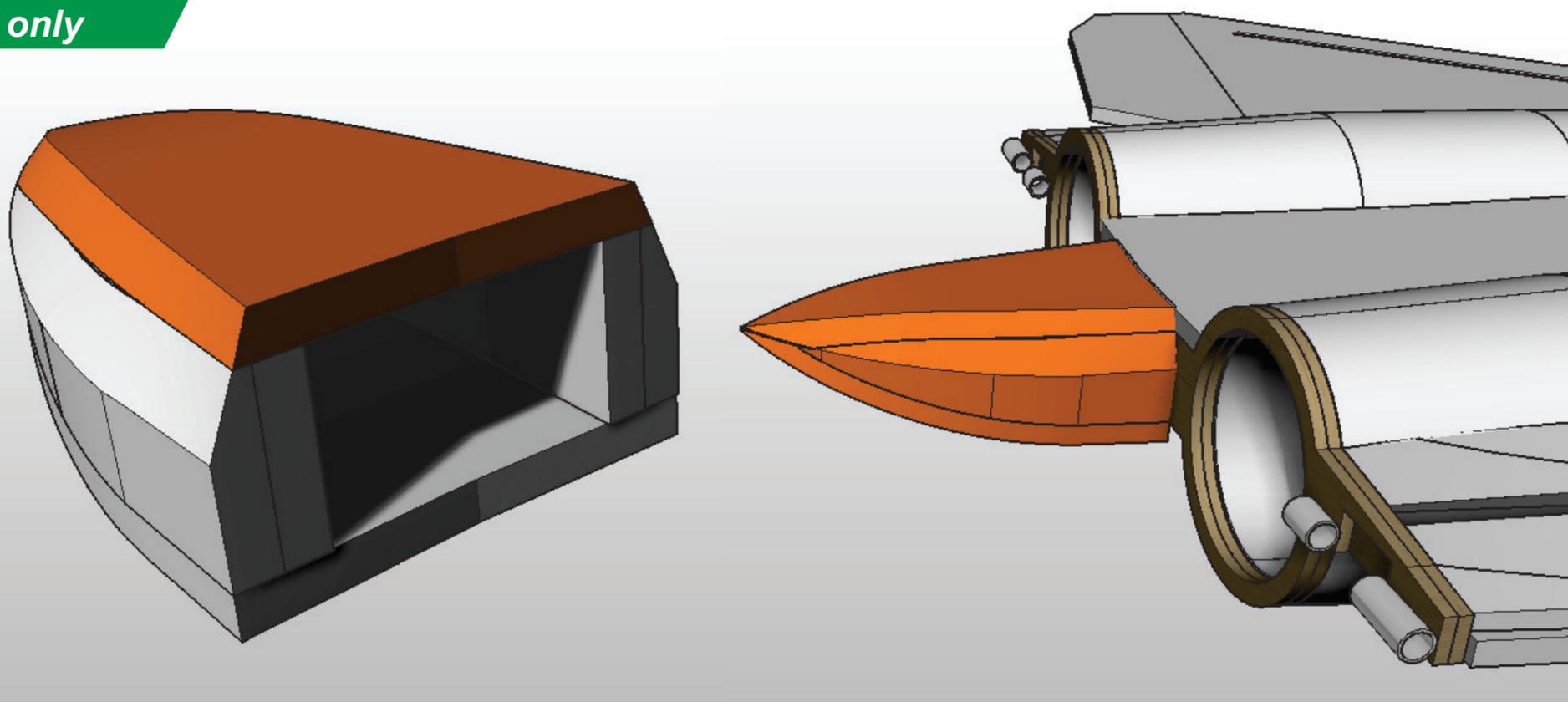


REAR AVIONICS POD

Pre curve the pieces and assembly as shown.



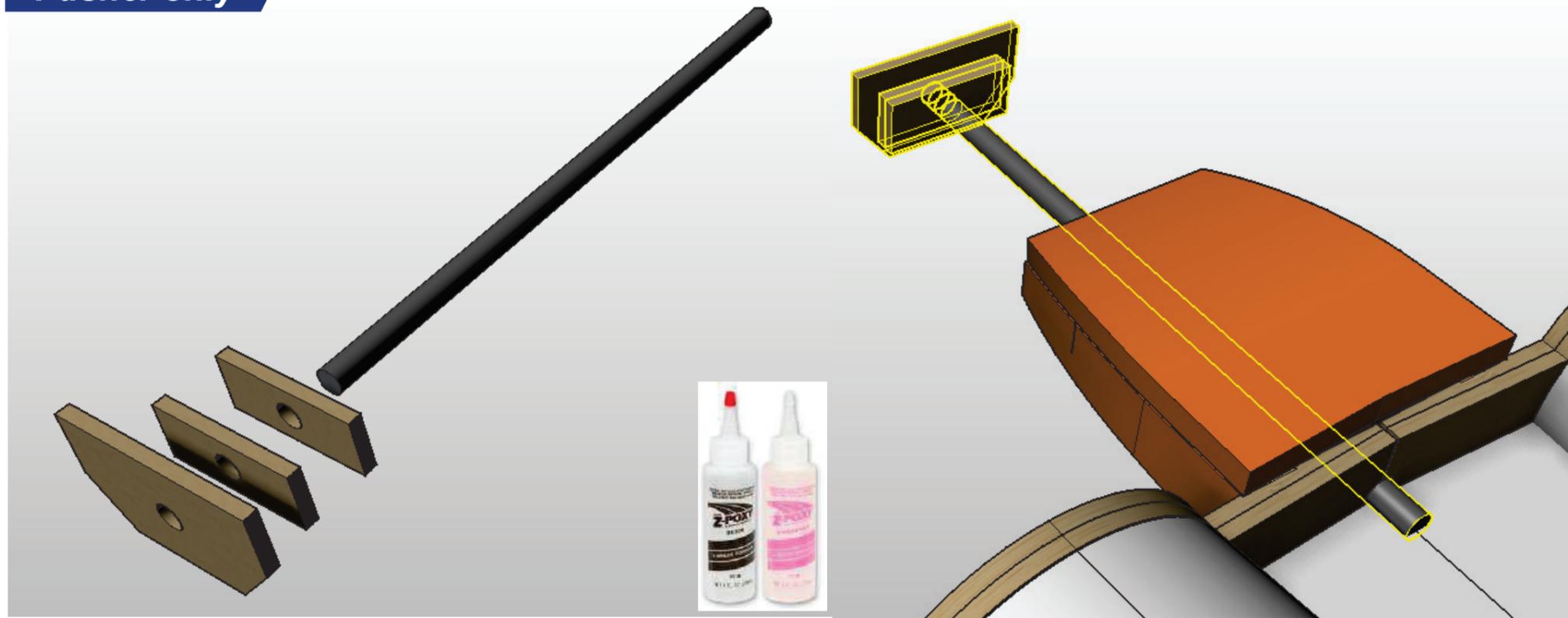
EDF only



Glue the pod on centreline to the aft bulkhead as shown.



Pusher only



Trim the tip off the Avionics pod according to the plans.

Check that your mounting plate fits within the footprint of the mount. If not, then enlarge it a little to ensure that the screws have enough wood to screw into.

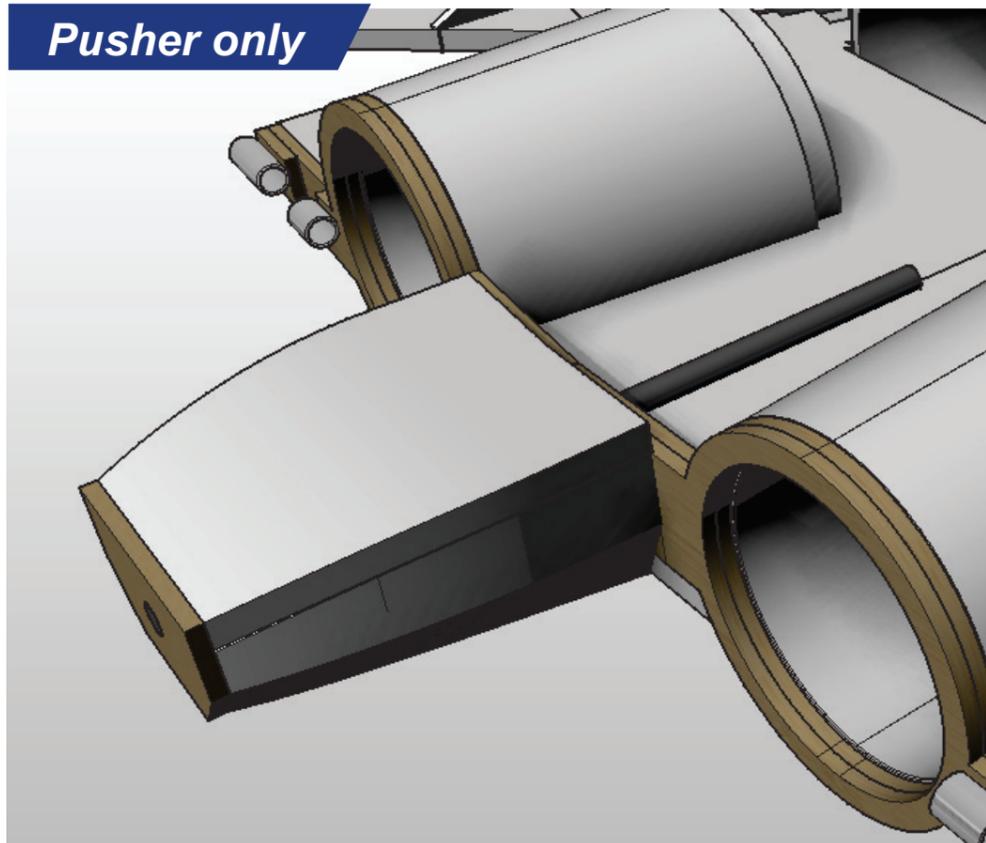
Glue the three lite-ply pieces together using the 180 x 6mm carbon tube as an aligner. Then glue to the end of the carbon using epoxy.

Slide the tube through the hole on centerline between the two lite-ply aft bulkhead pieces.

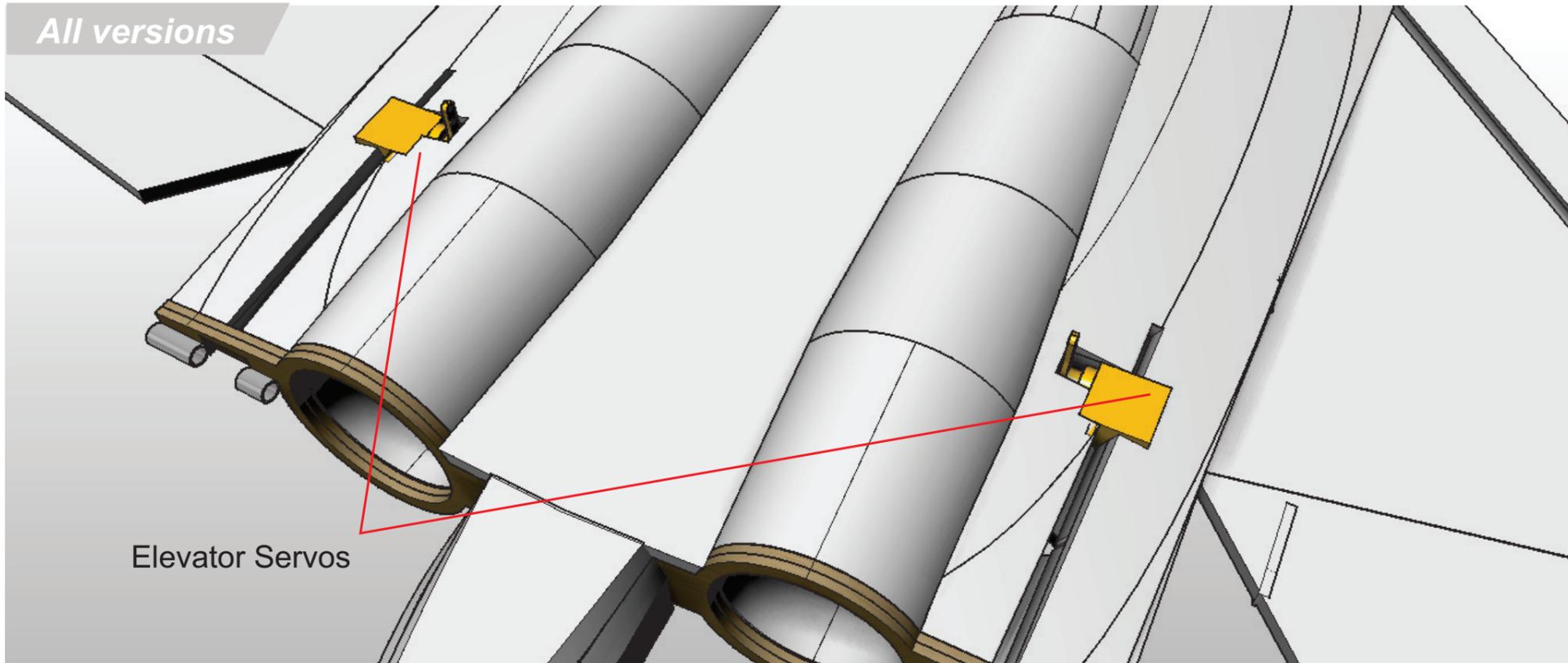
Trim away the foam where necessary, then slide the tube fully in place, glueing with epoxy.

Mount the motor.

Pusher only



All versions



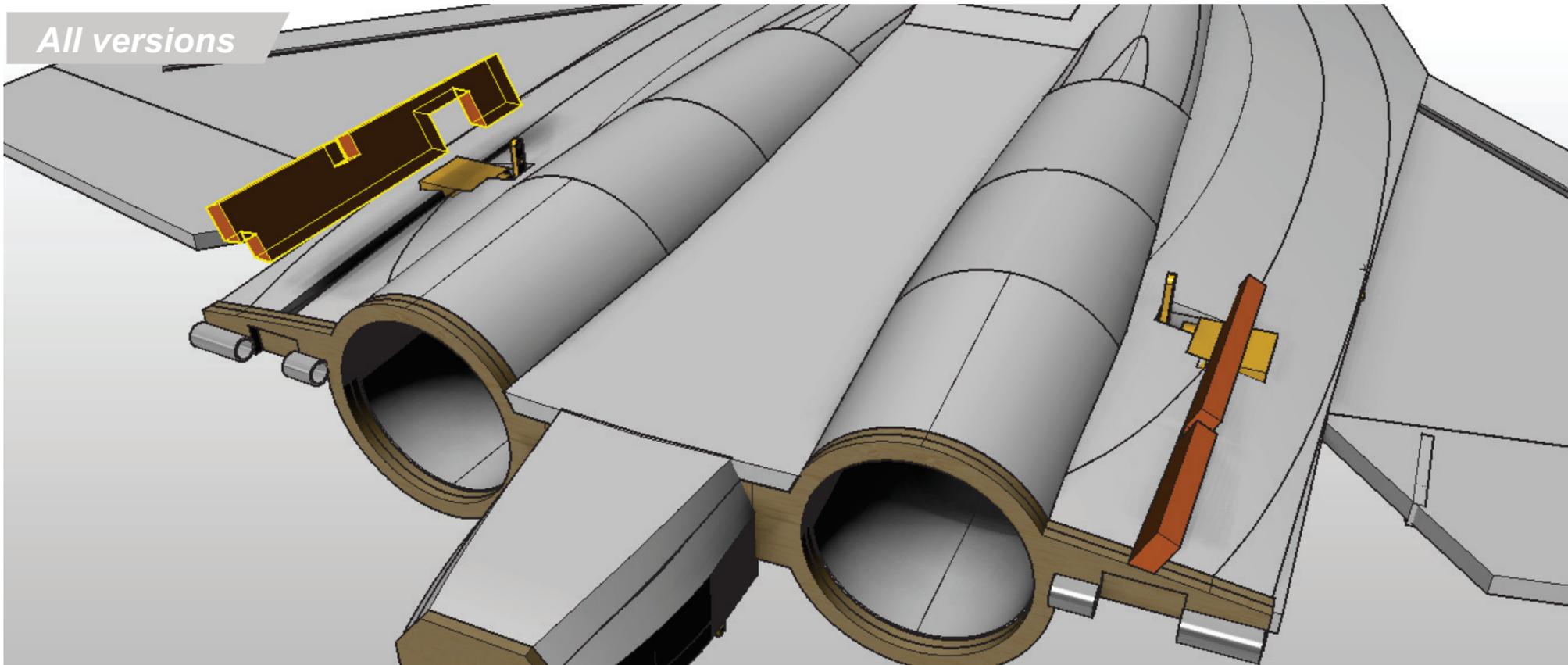
Elevator Servos

Dry fit the two elevator servos in place, trimming away the depron to ensure a neat snug fit.

These will need to be adjusted when the electronics are setup, so don't glue yet.



All versions

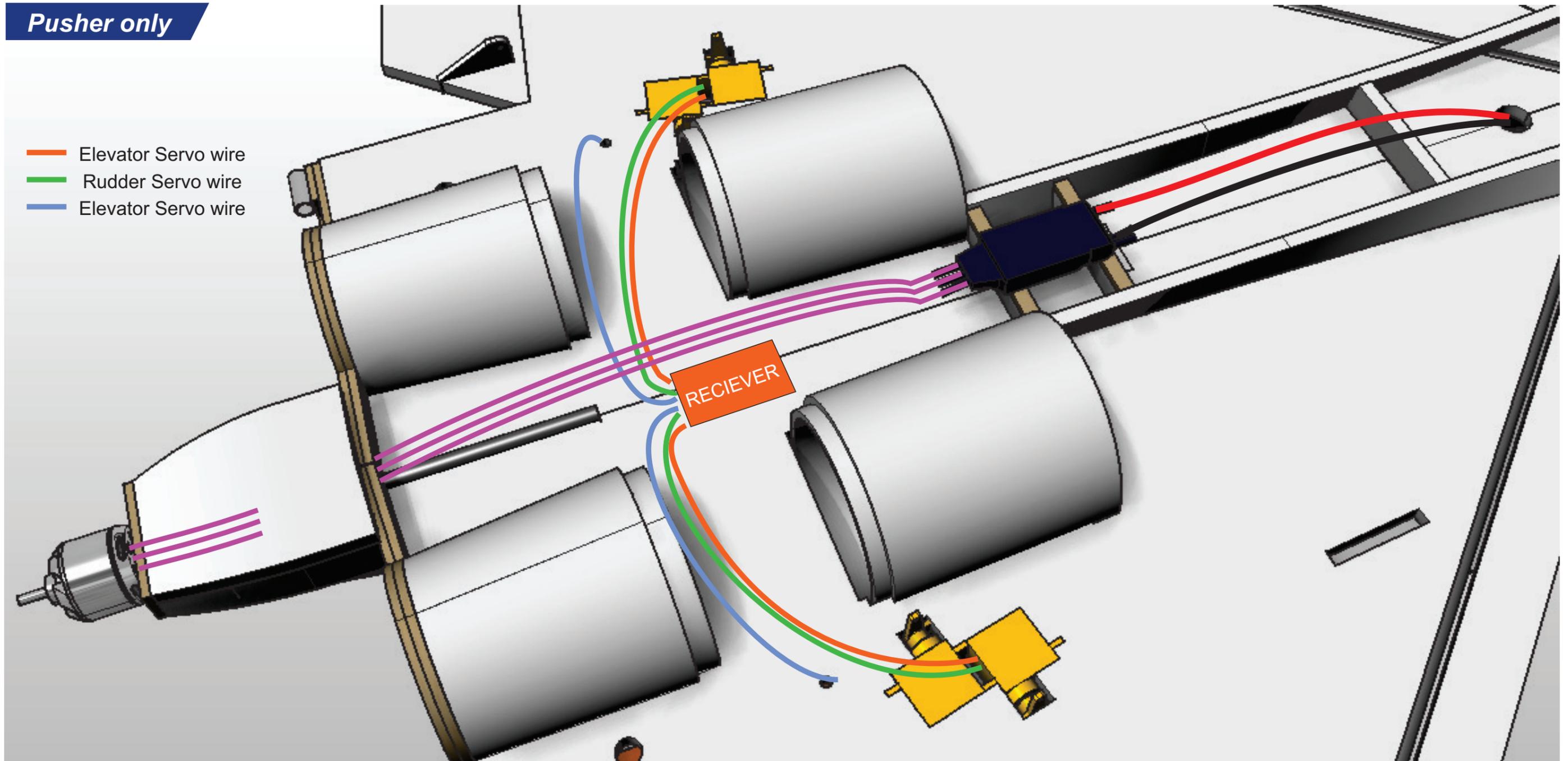


Dry fit the **Vertical Stabiliser bases**, ensure a snug fit, and the rudder shaft tube is protruding out of the underside of the fuselage.

As the servos will need adjustment upon setup, dry fit for now.



Pusher only



Run the Elevator servo cable through the wing to protrude as indicated.

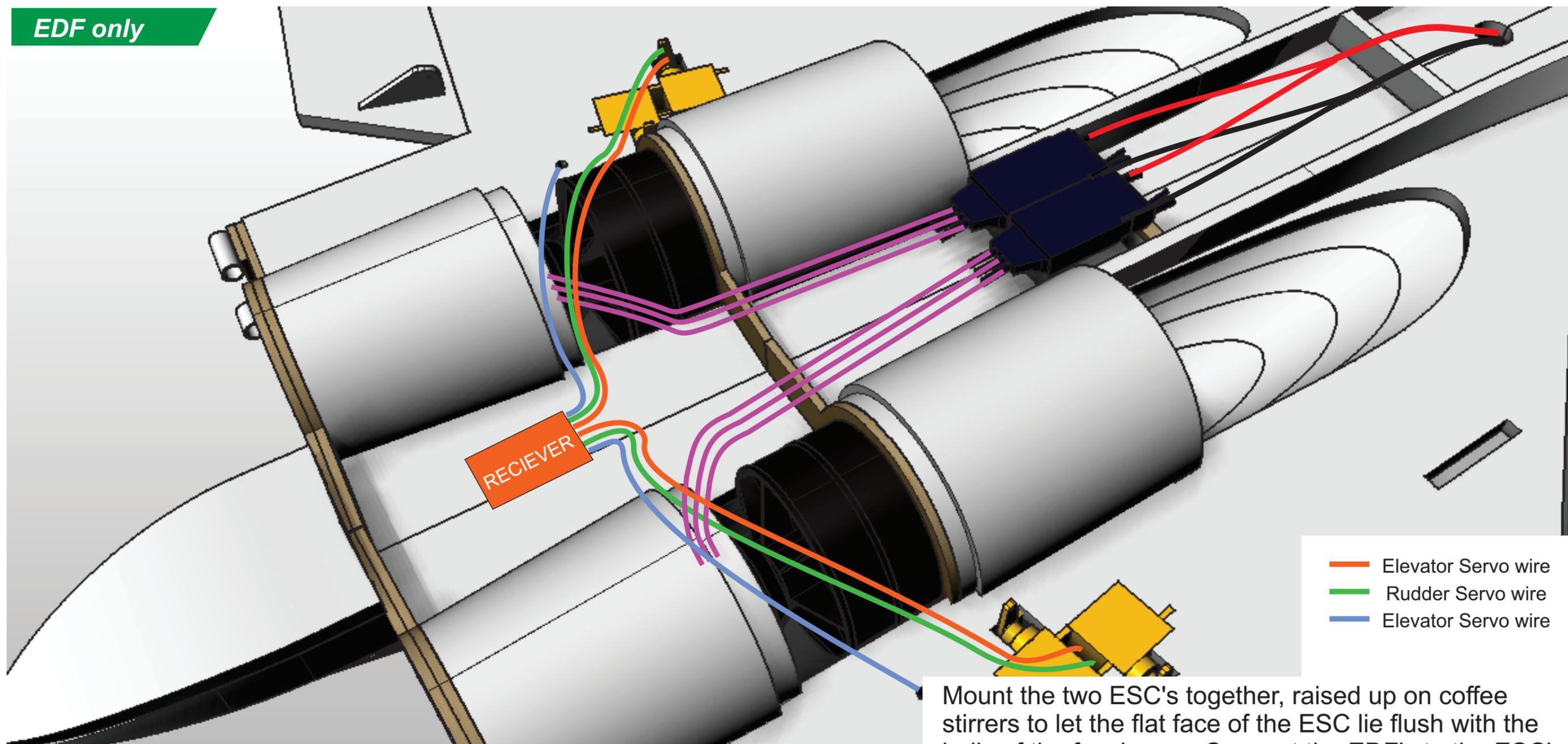
Dry fit the Rudder and Aileron servos. Carve a shallow channel in the wing to run all the servo cables through the wing, into the RX as shown. Connect to the RX. Test the system.

Run the motor cables through the aft bulkhead and up through the belly of the avionics pod.

Mount the ESC raised up on coffee stirrers to let the flat face of the ESC lie flush with the belly of the fuselage. Connect to the motor/battery connector.

Connect the ESC to the Receiver (RX) Test (and adjust) the system to ensure the propellor is spinning the correct way.





RECIEVER

- Elevator Servo wire
- Rudder Servo wire
- Elevator Servo wire

Mount the two ESC's together, raised up on coffee stirrers to let the flat face of the ESC lie flush with the belly of the fuselage. Connect the EDF's to the ESC's. Join the two ESC's power cables together to form a single pair as shown.

Run the Elevator servo cable through the wing to protrude as indicated.

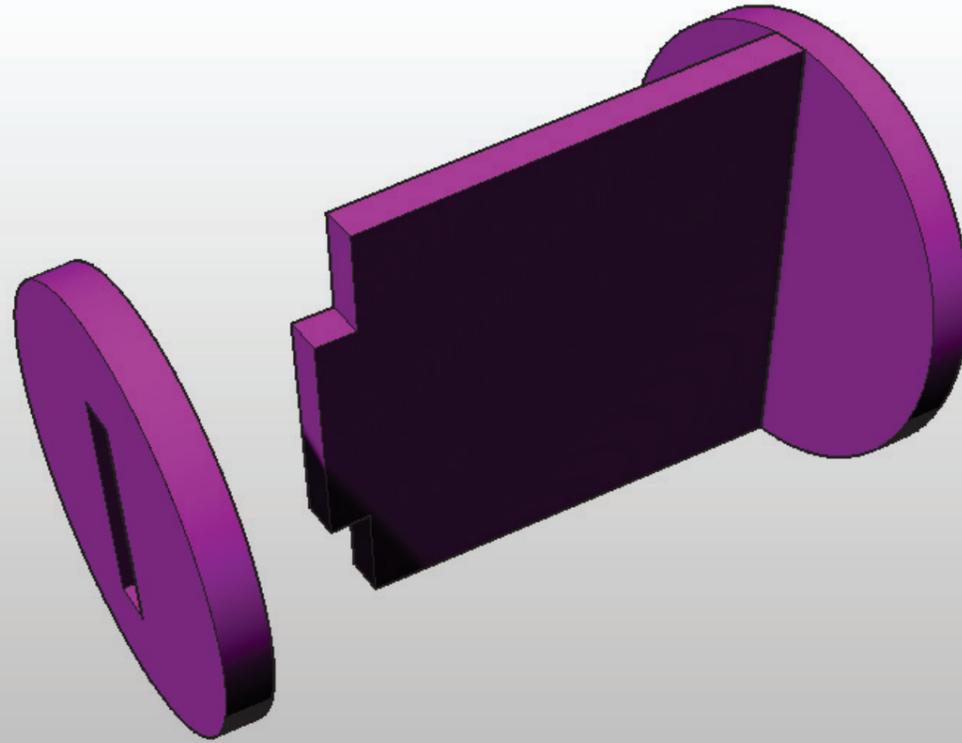
Dry fit the Rudder and Aileron servos. Carve a shallow channel in the wing to run all the servo cables through the wing, around the edf then into the RX cavity as shown. Connect to the RX. Test the system.

Carve two notches into the wooden EDF bulkhead to pass the motor cables through.

Connect the ESC's to the Receiver (RX) - if you are using the onboard BEC, then snip one of the red servo wires from the ESC to the RX - alternatively snip both and use a dedicated BEC. Test (and adjust) the system to ensure the EDF's are spinning the correct way.



All versions



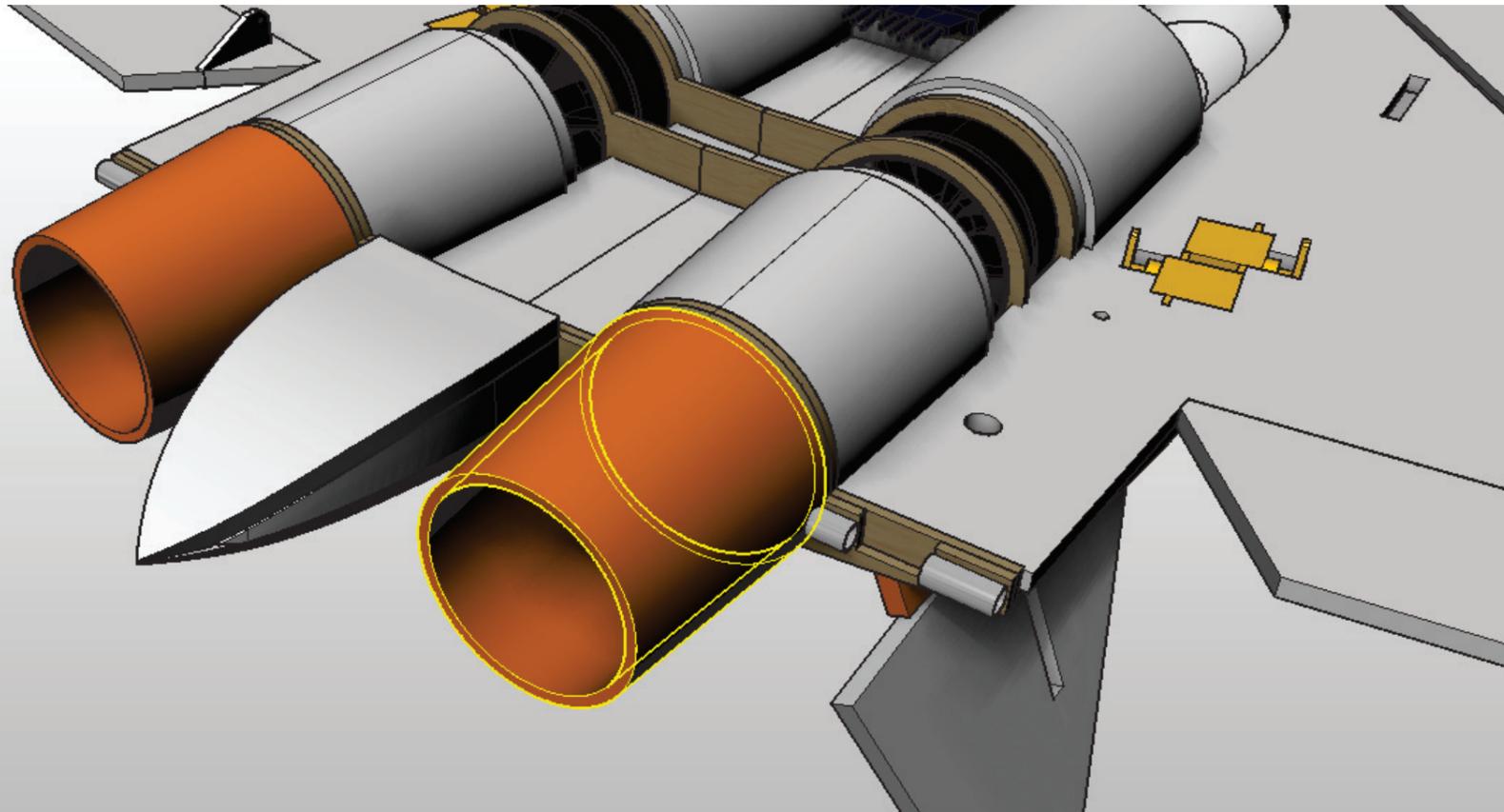
Assemble the Exhaust cone Jig to suit your EDF size.

For the Pusher version you can have either.

Make the exhaust cones in the same way as the Nacelle pieces.



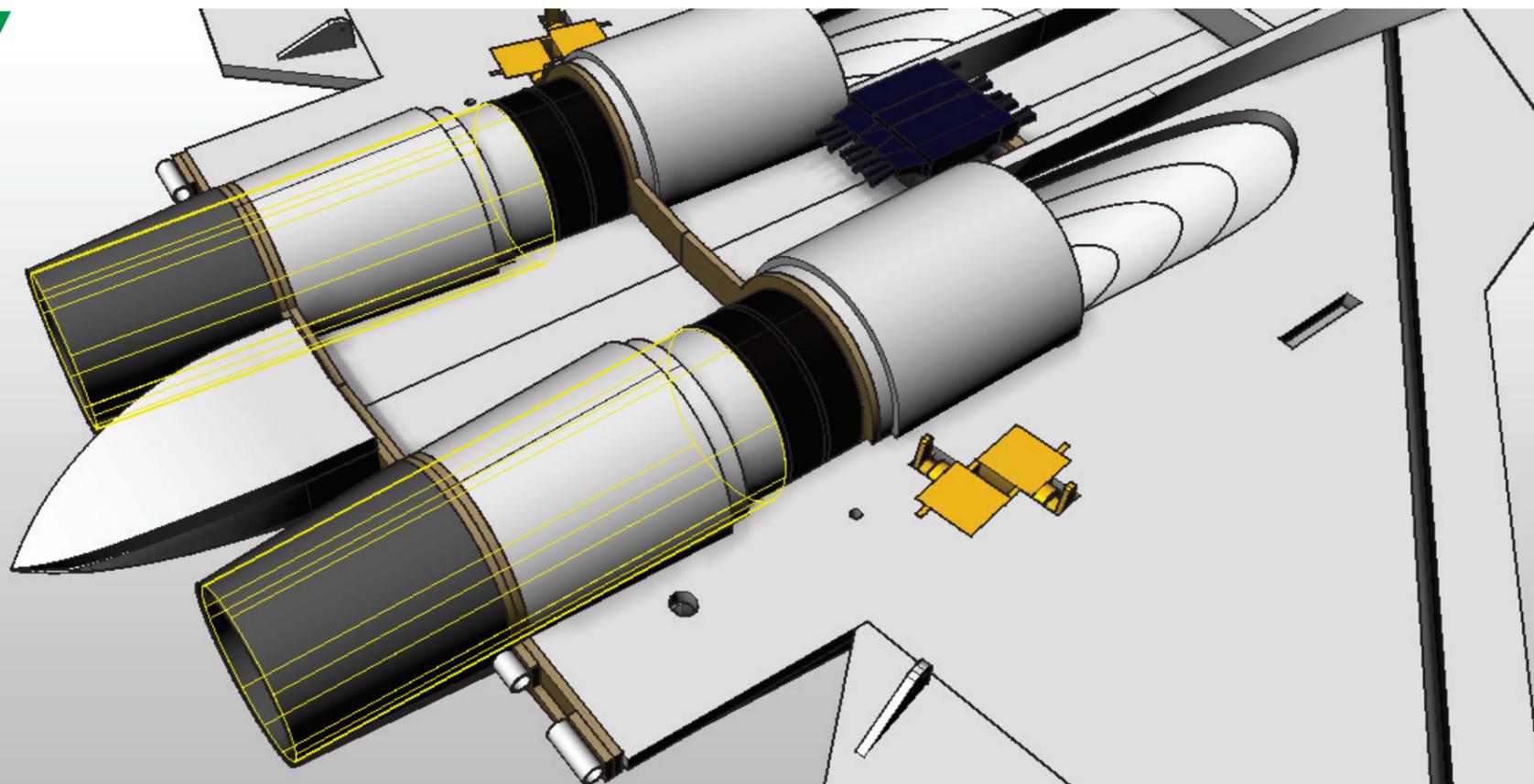
All versions



Glue the exhausts to the assembly.



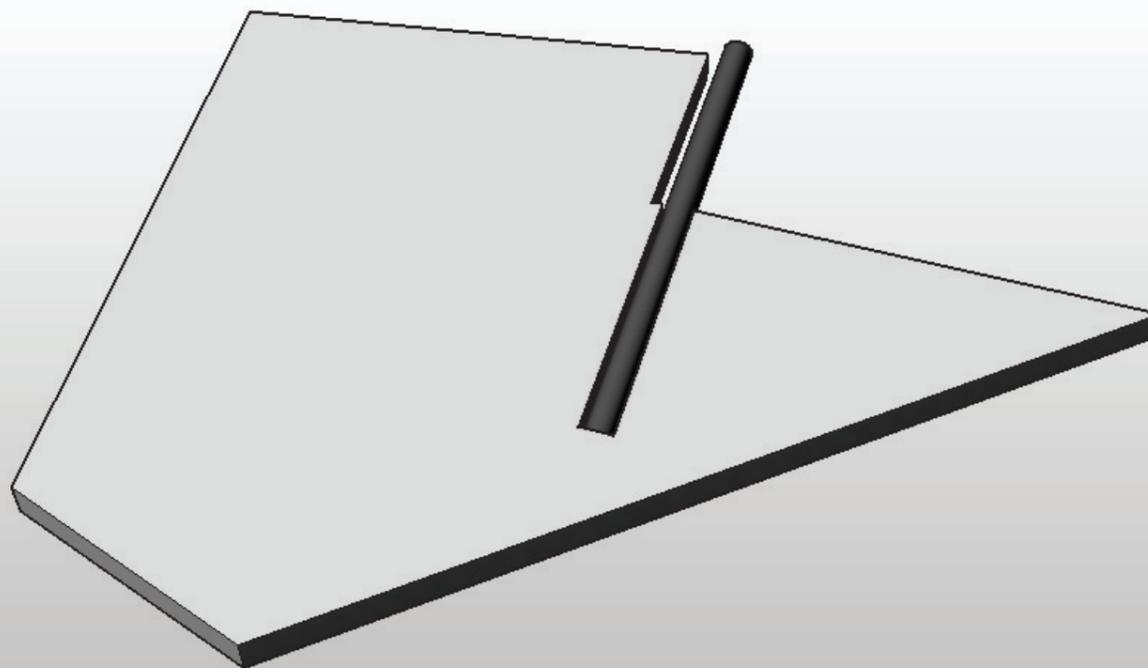
EDF only



Make a paper template, then using plastic sheet (250-400 microns), construct thrust tubes that connect to the EDF units and terminate at the tips of the exhausts.

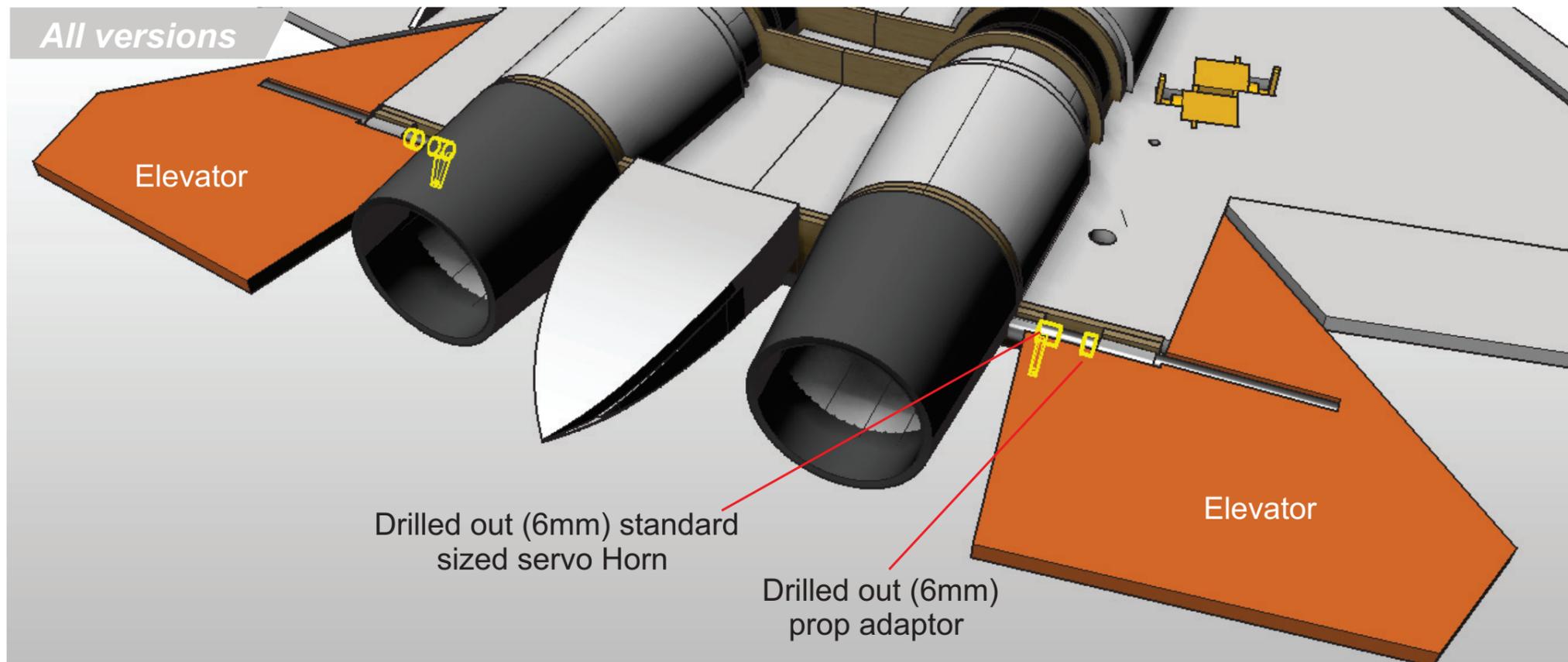


All versions

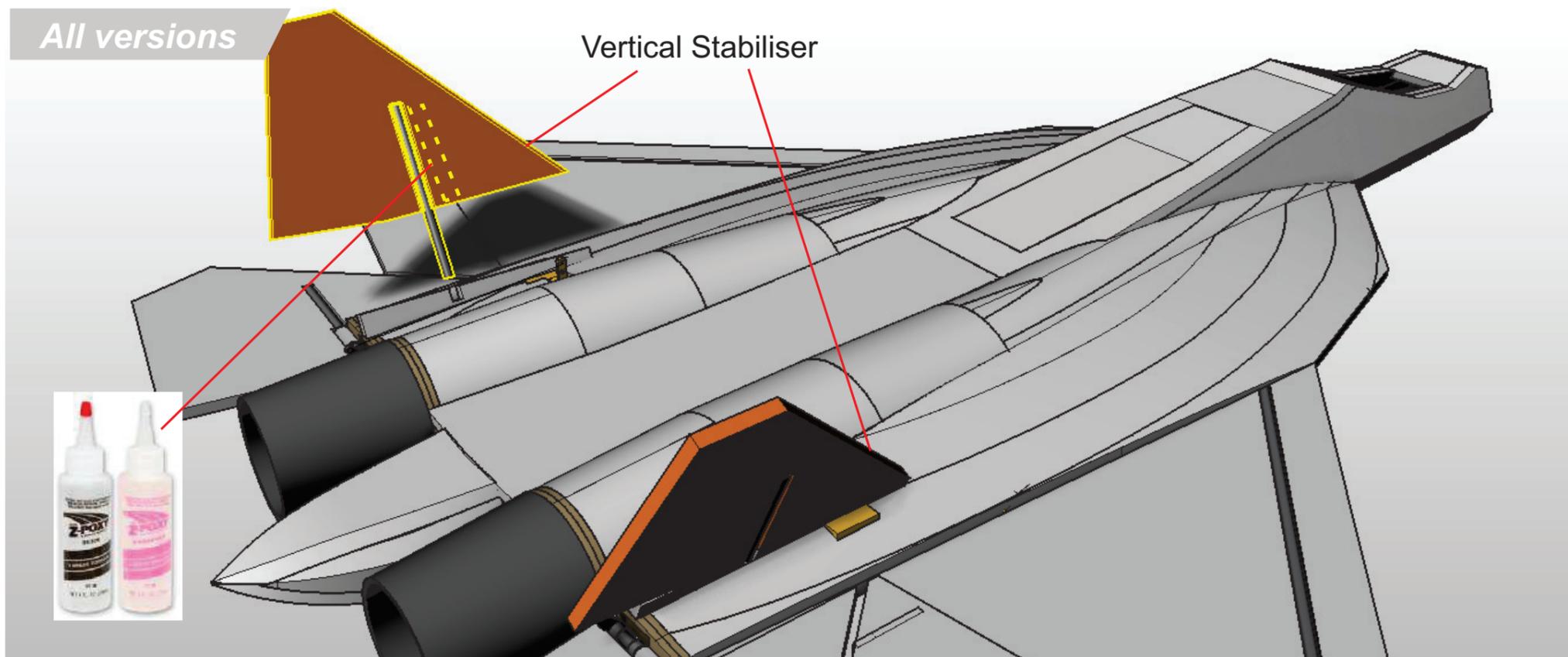


Glue the 6mm Carbo tube into the elevators as shown, using the same method as your wing spar. Be careful not to allow glue to seep past the foam, up the shaft.





Use a drilled out standard sized servo horn along with a drilled out prop adaptor ring to hold the elevator secure.



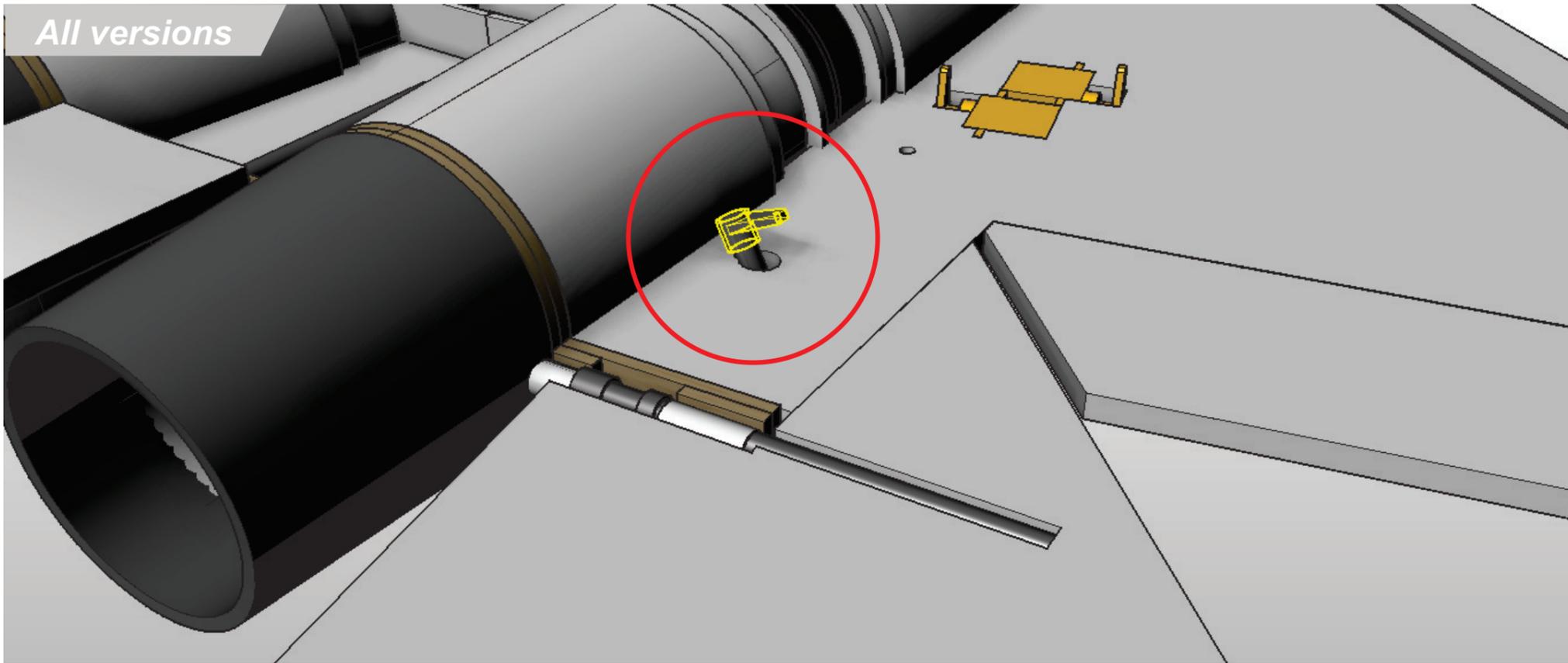
Exactly as you Epoxied the Elevators and 6mm carbon spar together, do the same for the **Vertical Stabilisers**.

If you are planning to have fixed rudders, you can cut the spar shorter to prevent it protruding under the plane, and glue the rudder to the plane at this stage.

If you are planning to have moving rudders, then insert and glue an aluminium tube to the foam sheet to support the rudder shafts.

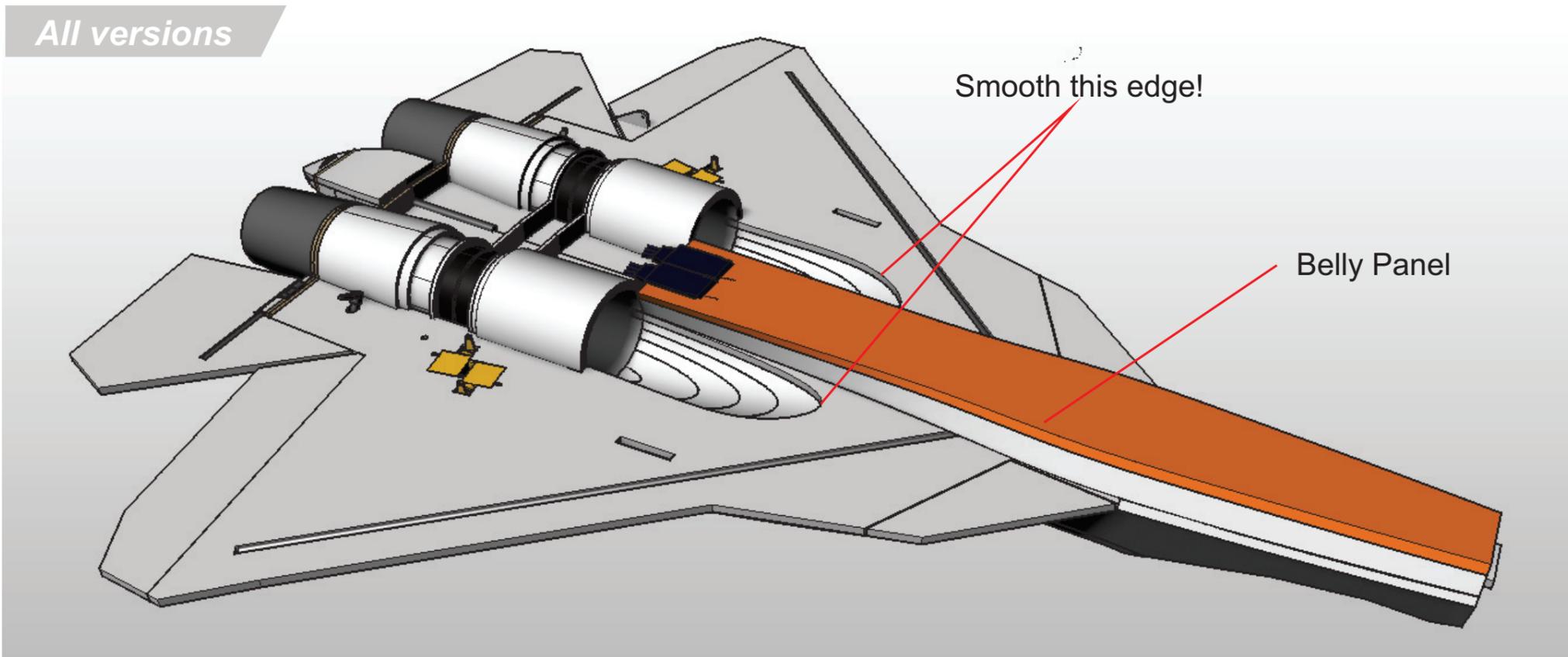


All versions



Fit 6mm drilled out standard sized servo horn to the ends of the rudder shafts.

All versions

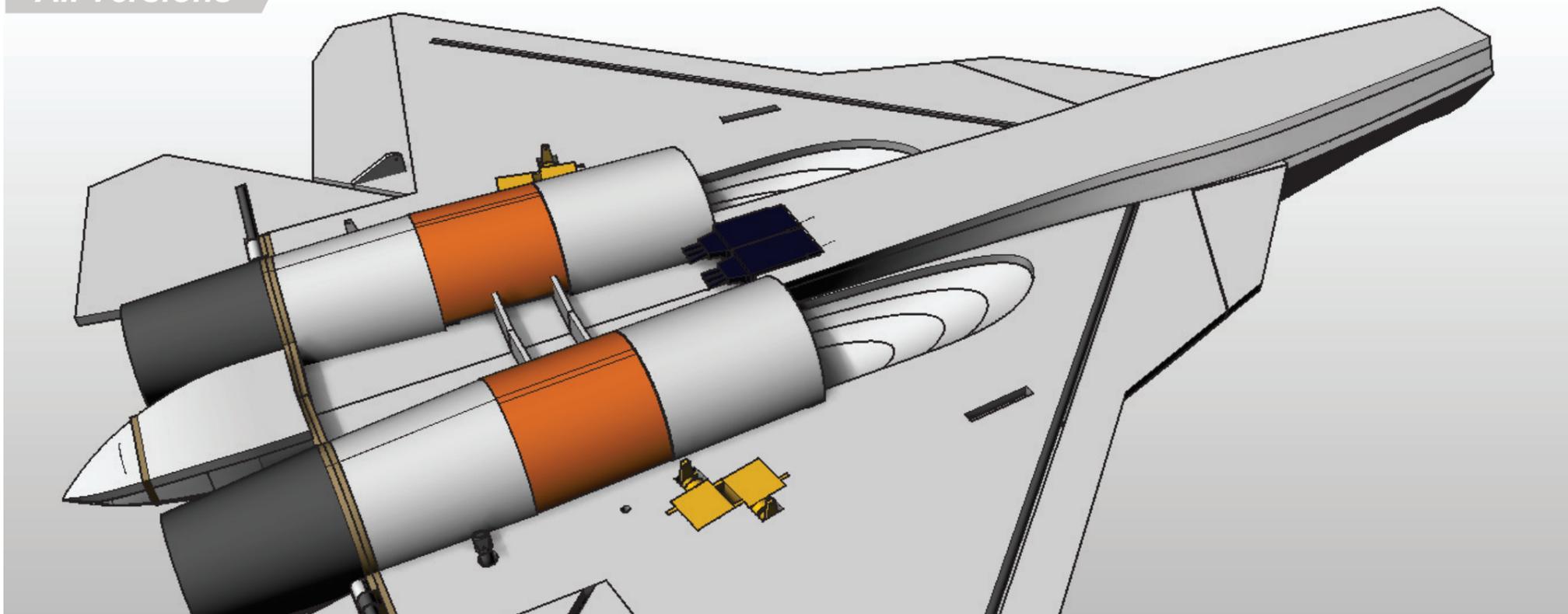


Glue the **Belly panel** in place.

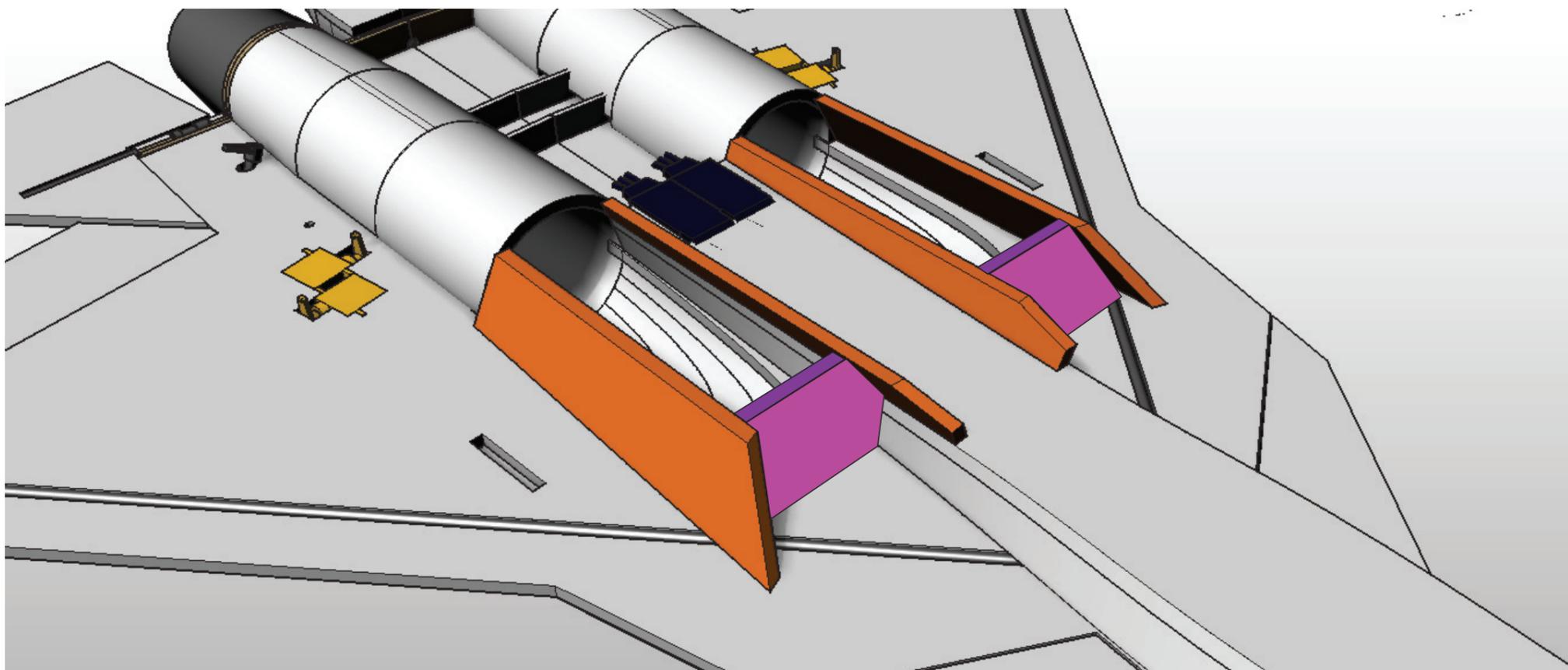
Mark on the underwing where the Air intake Nacelles will be fixed to, then within that area, sand the edges of the wing in the intakes to allow a smooth pathway into the ducted fan.



All versions



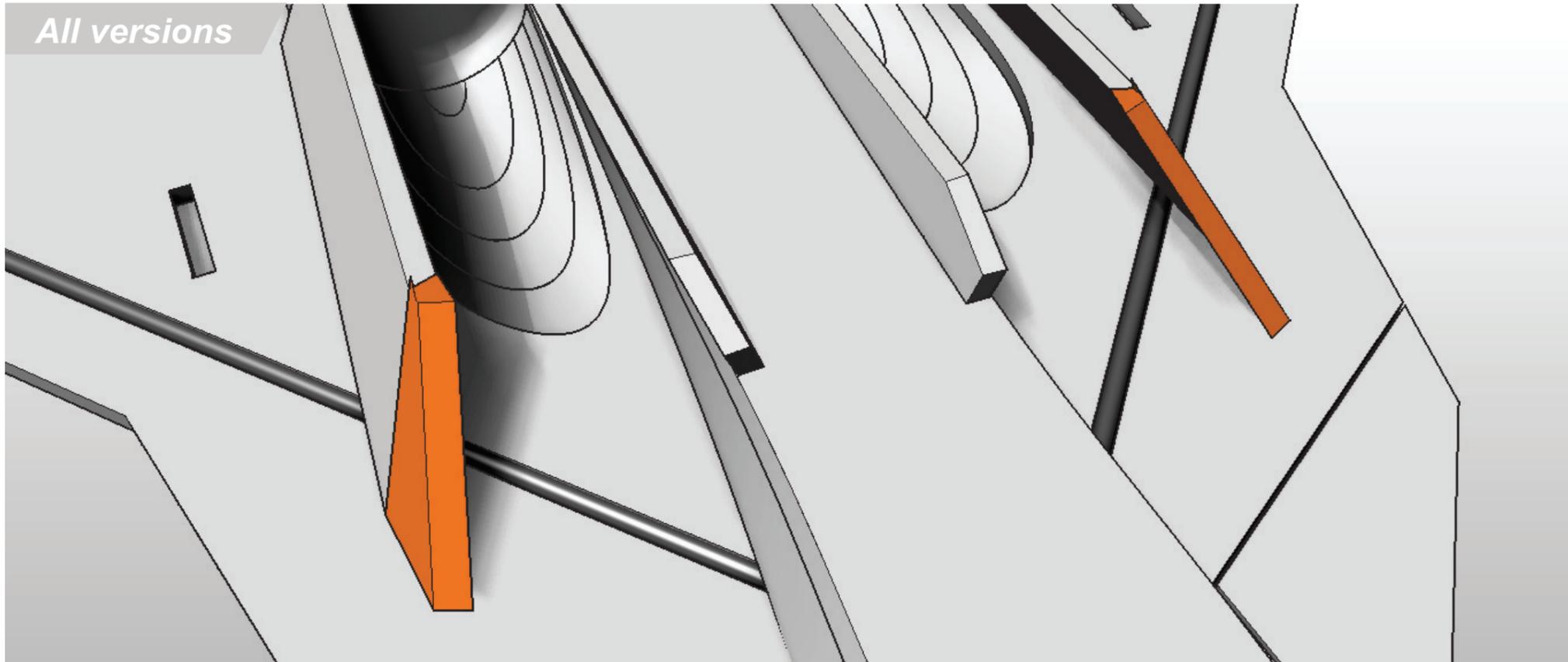
Using 3mm foam, bridge the gap in the Nacelle.



Using the Nacelle forming jigs to help position the forward nacelle inner and outer parts.



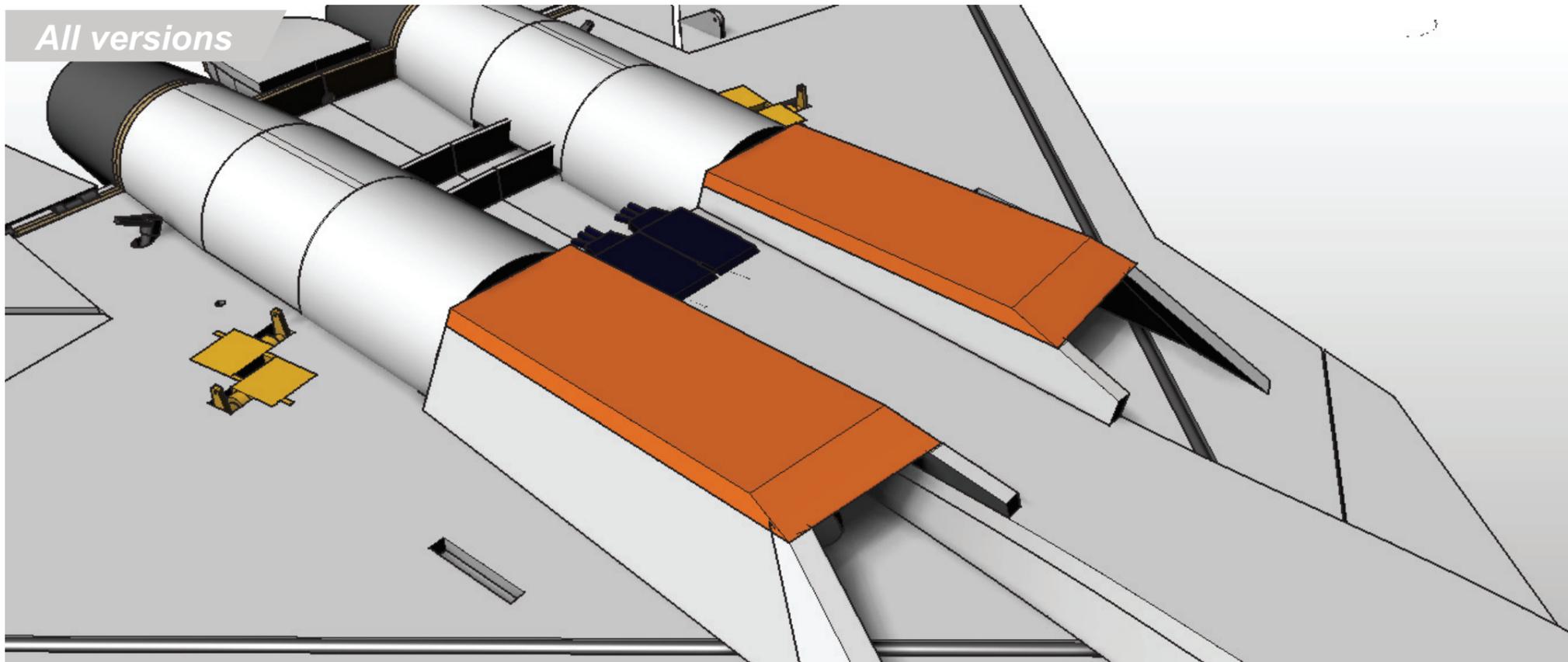
All versions



Glue the Forward Nacelle Side Deflectors to the assembly.



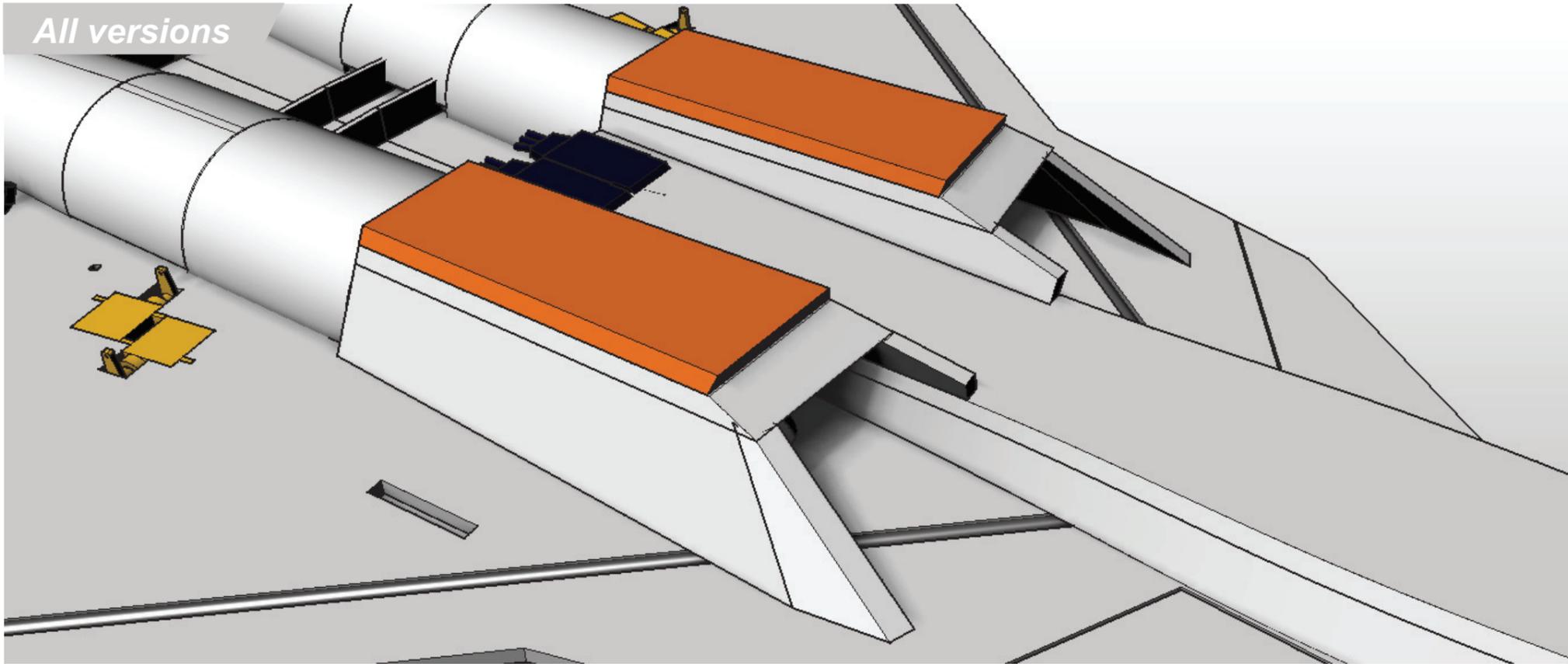
All versions



Glue the Forward Nacelle Inner Belly to the assembly.



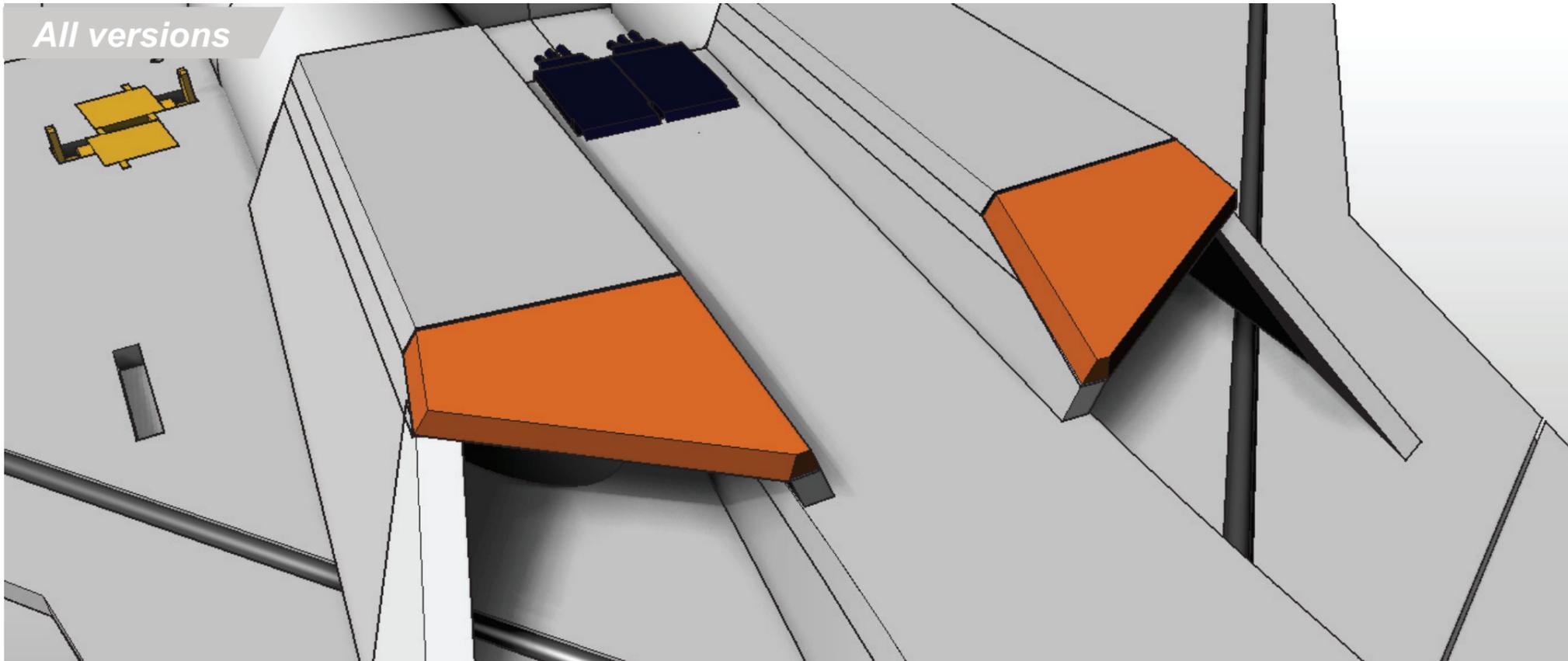
All versions



Glue the Forward Nacelle Outer Belly to the assembly.



All versions

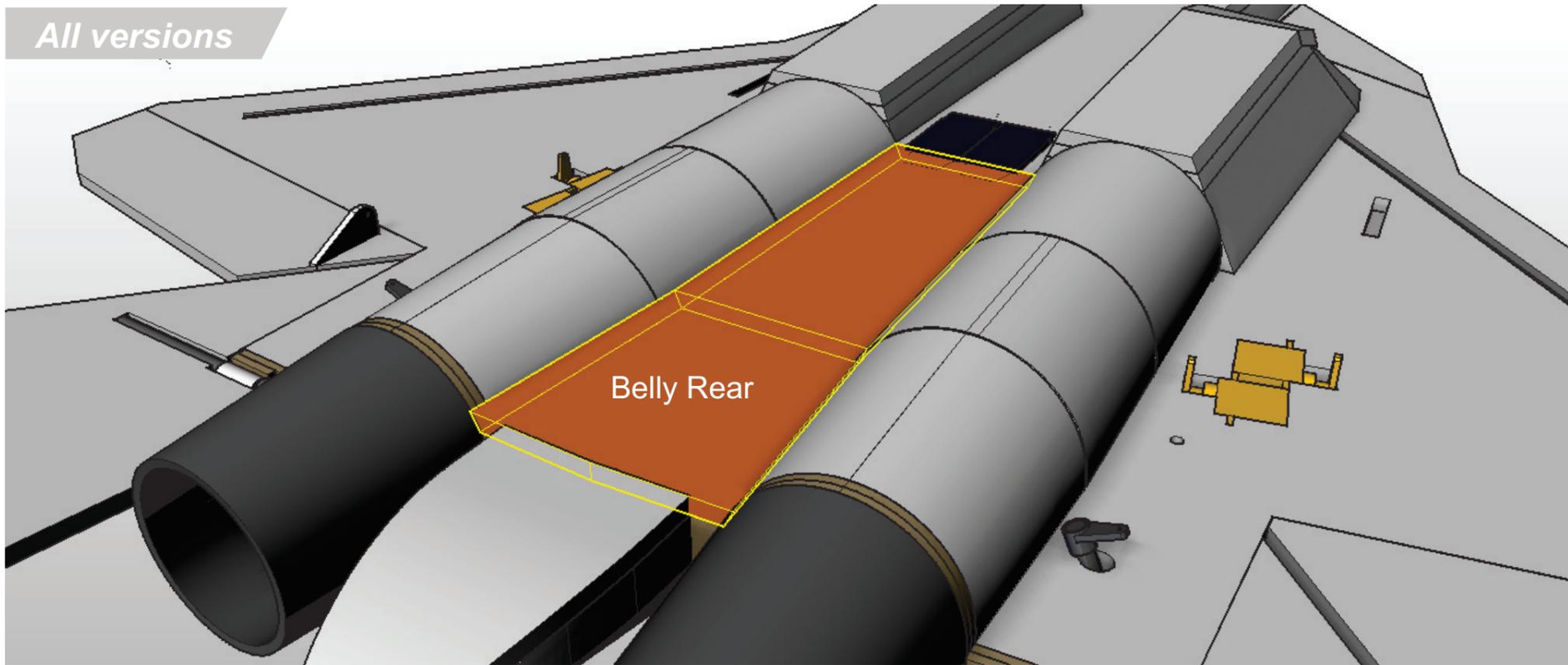


Glue the Forward Nacelle Intake deflector to the assembly.

You may wish to make this part from 3mm foam sheet / 3mm lite-ply, as it will easily take damage on belly landings.



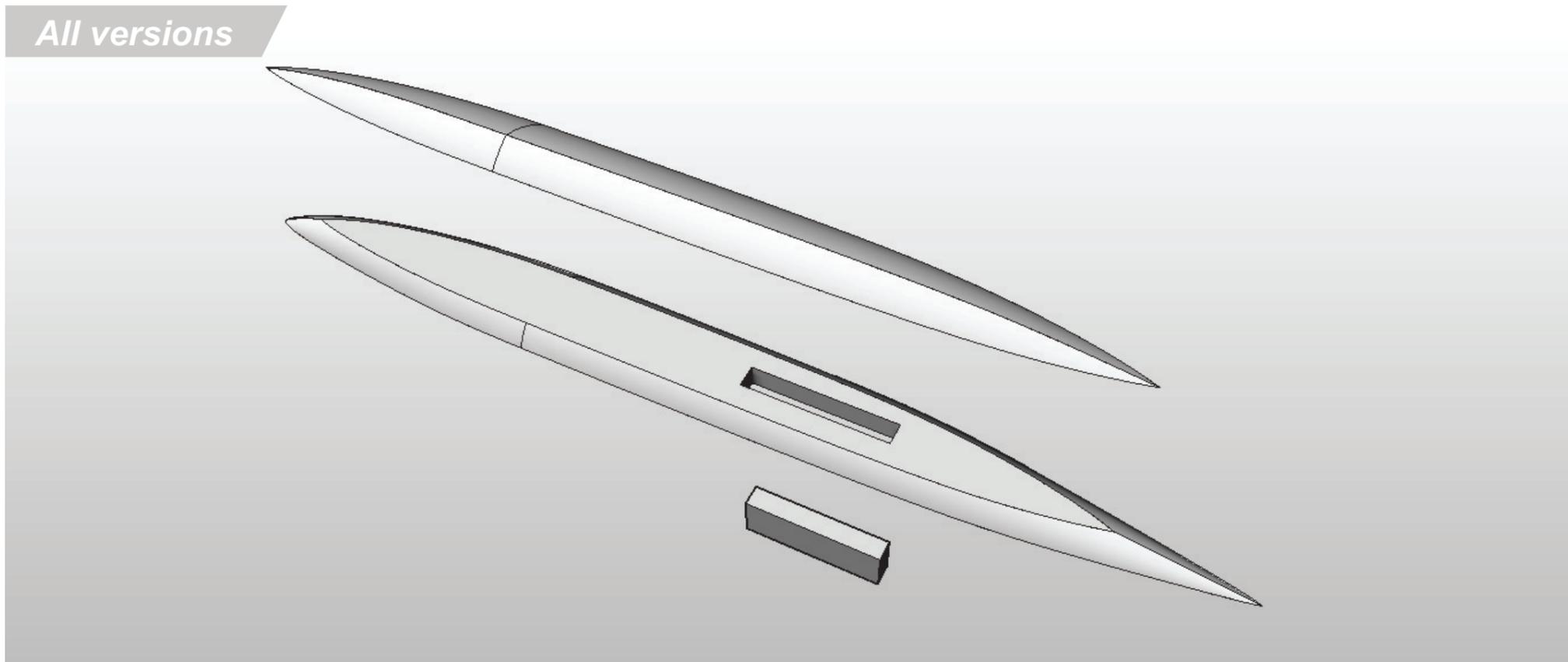
All versions



Glue the **Belly Rear** panel to the fuselage, sanding to shape where necessary.



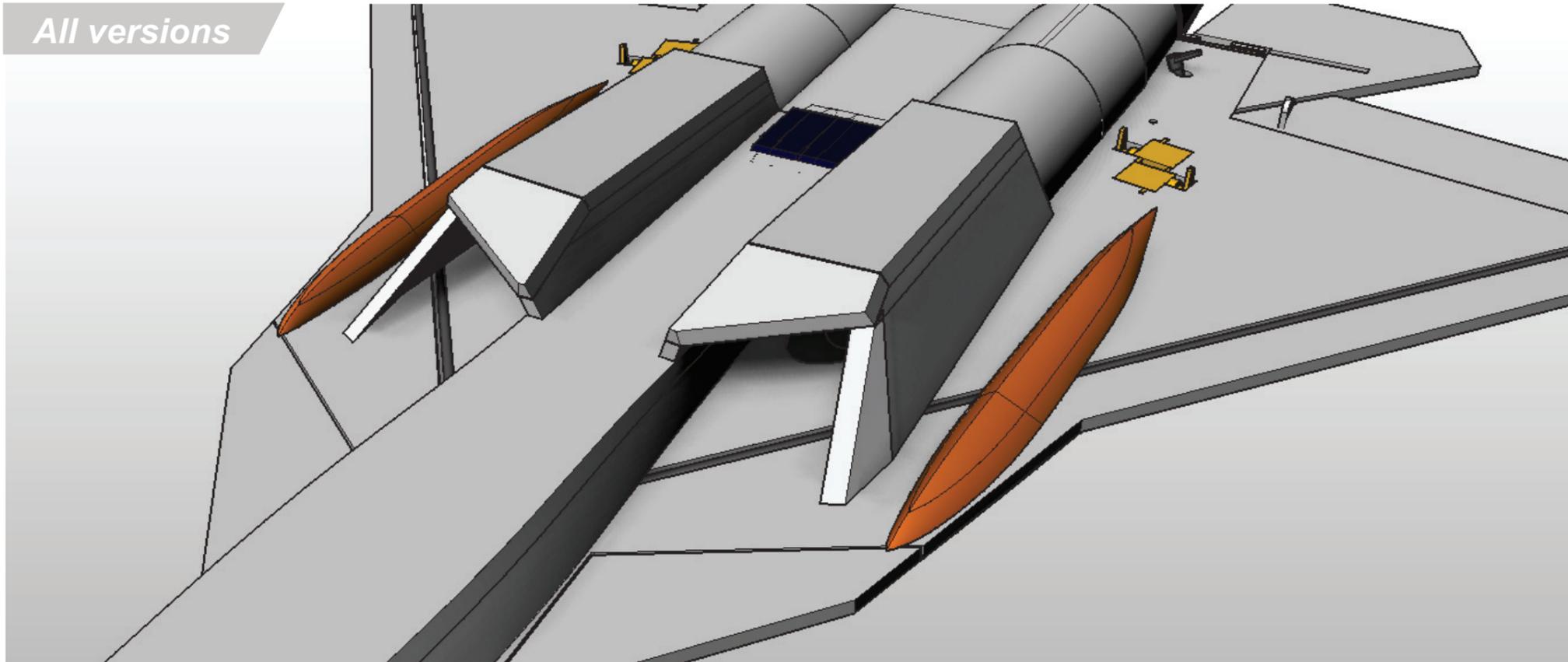
All versions



Glue the **Side Weapon pod parts** together and sand to shape.



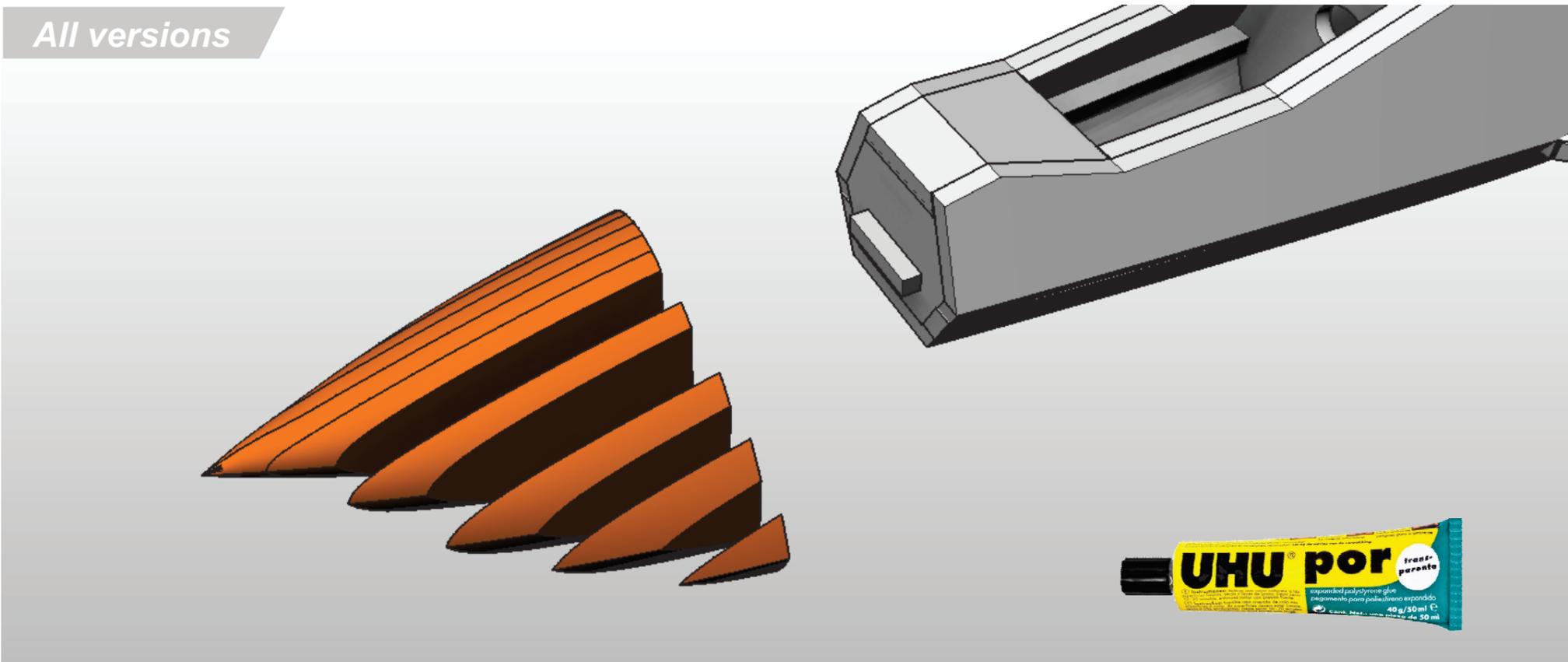
All versions



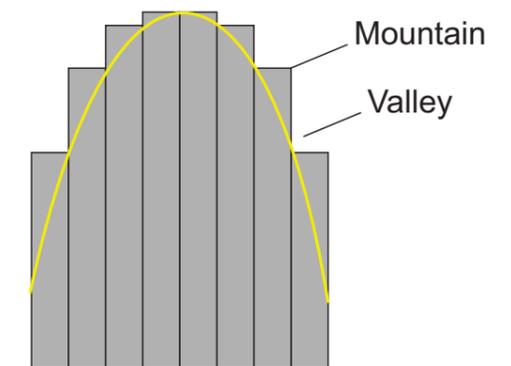
Glue the side weapons pods to the assembly, be careful not to put them on the wrong way around.

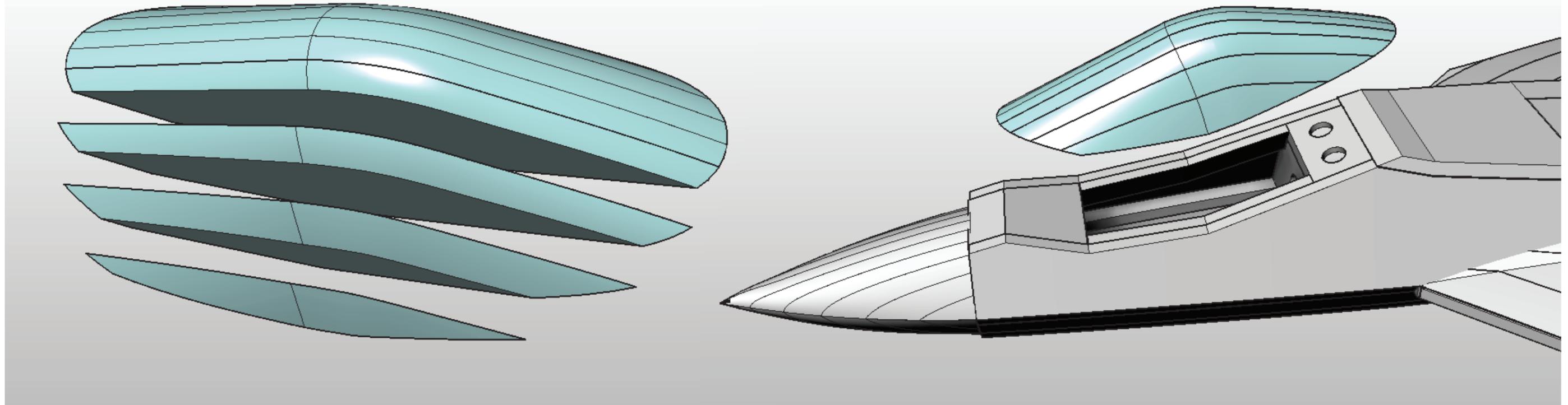


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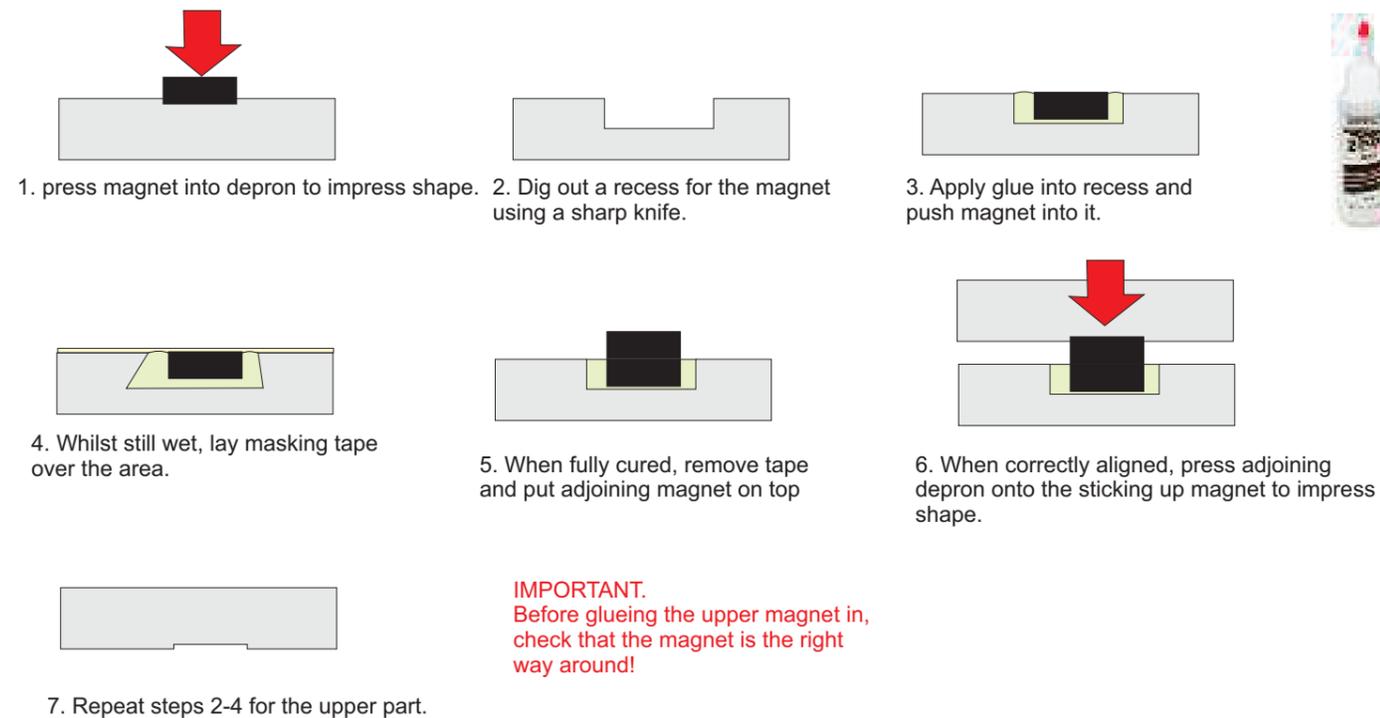


Laminate the Nosecone pieces together and sand the mountains to the valleys until the true shape has been achieved.

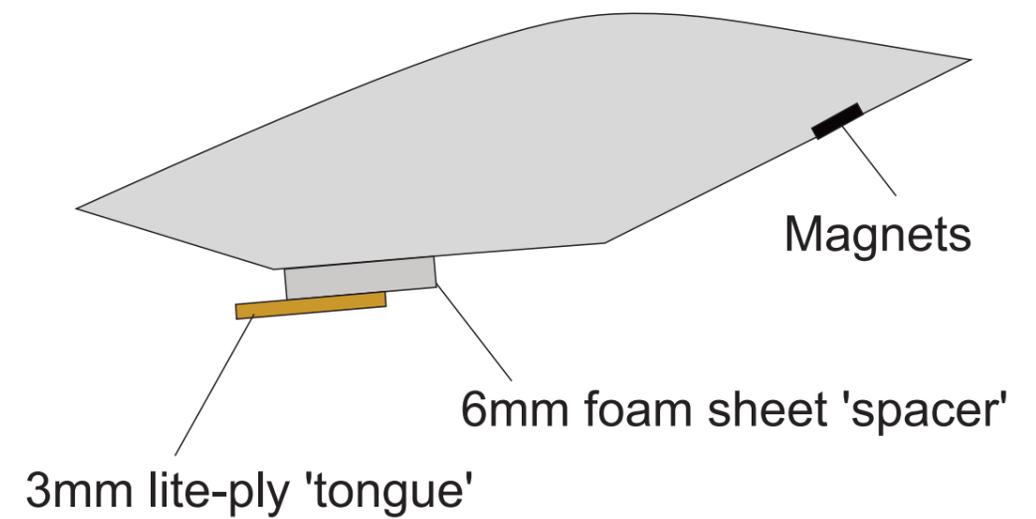


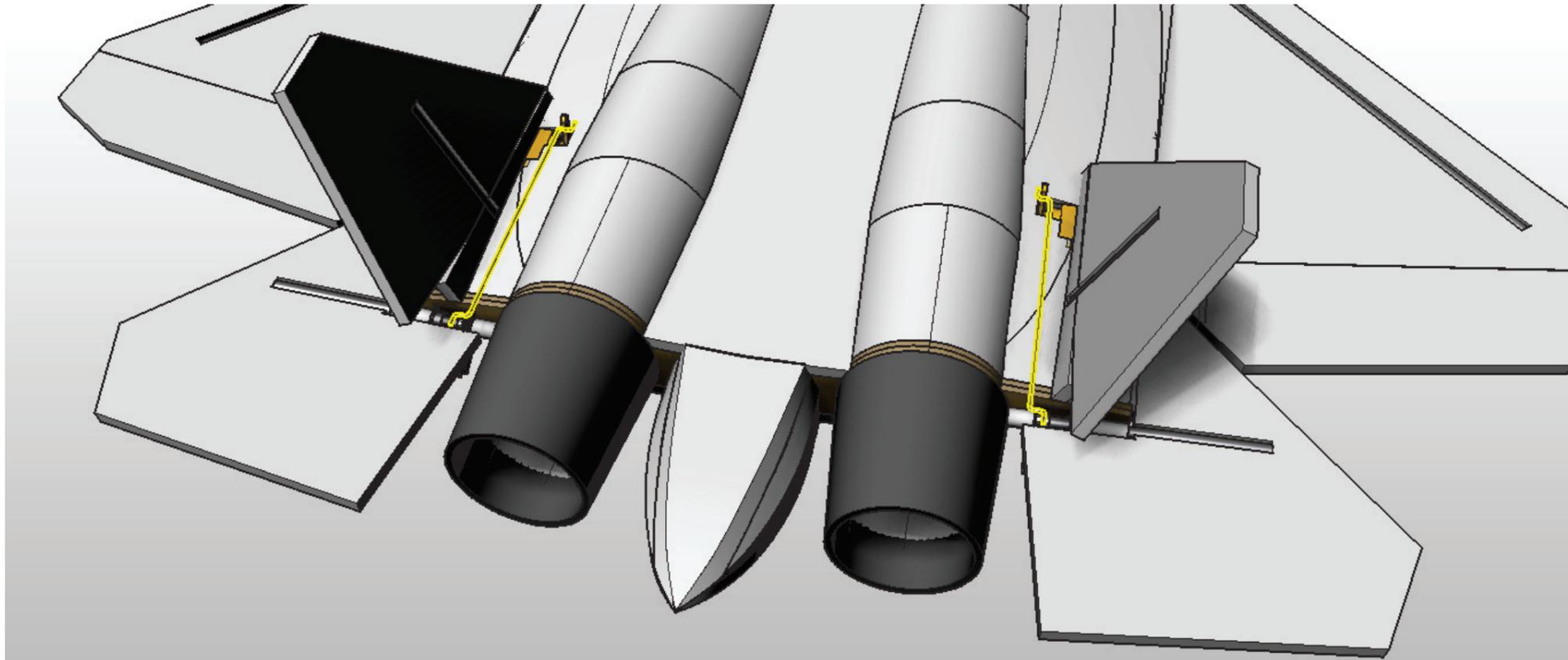


Create the canopy in the same way as the nosecone and add magnets and a tongue as shown.

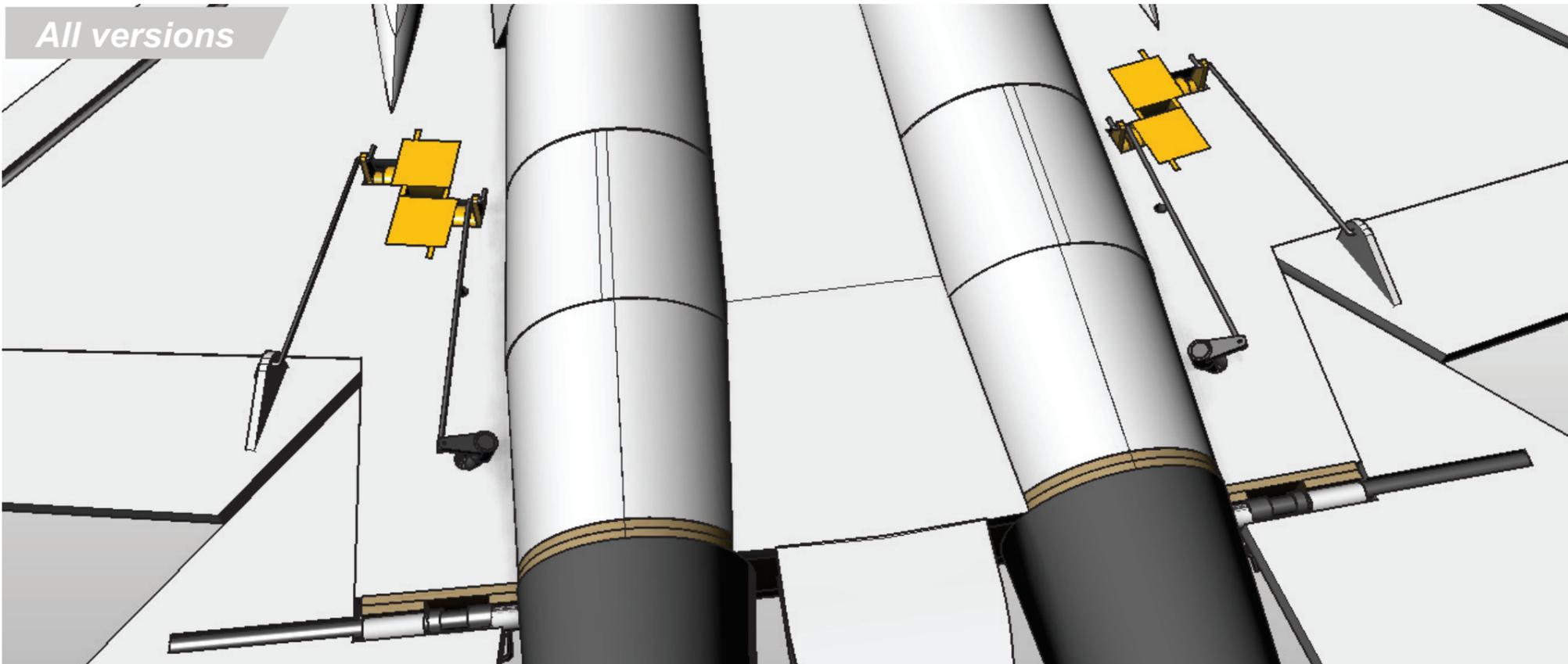


IMPORTANT.
Before glueing the upper magnet in, check that the magnet is the right way around!





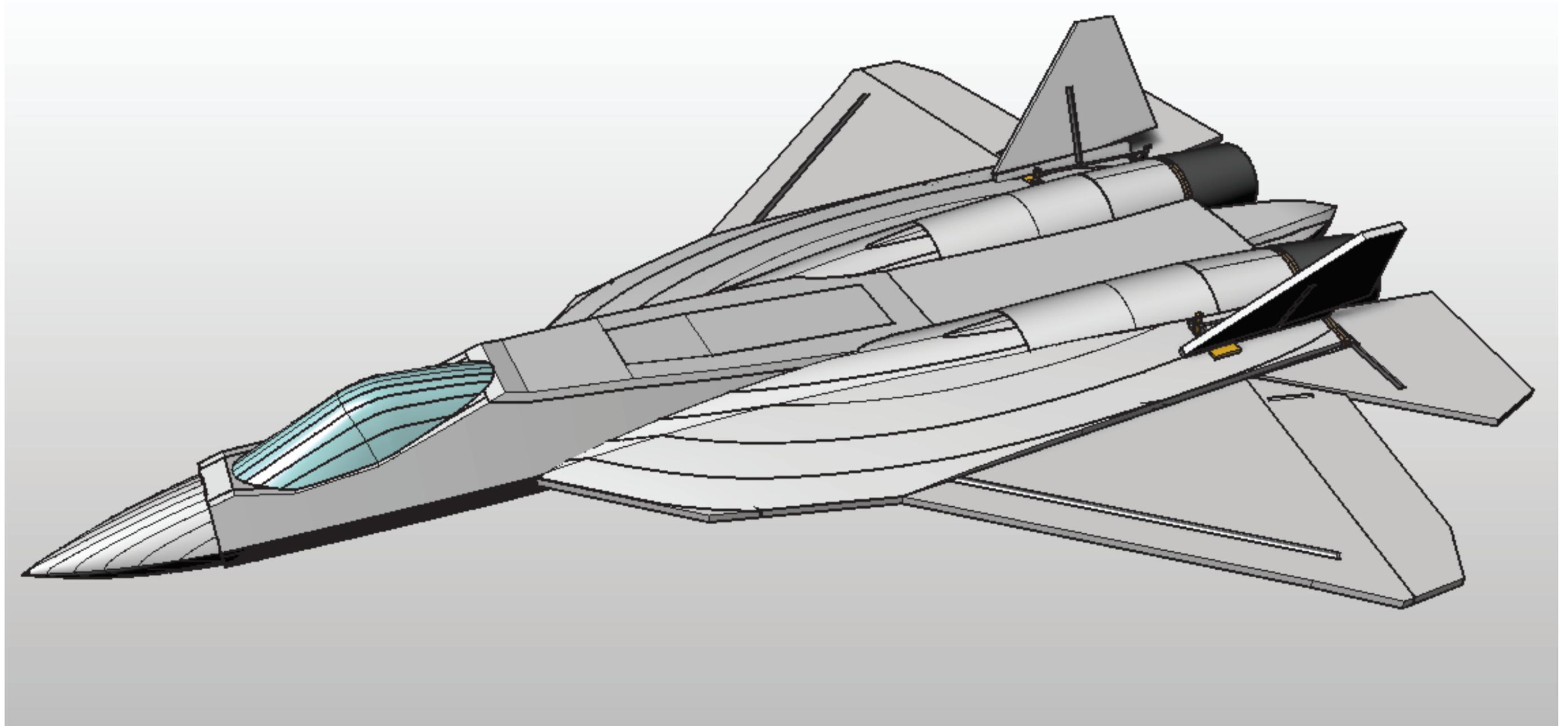
Connect the elevator servo to the elevator control horn.



Connect the Ailerons as shown.

Connect the Rudder servos to the rudder control horn.





Congratulations, your SU-57 is complete. Either fly it as it is, or finish it further.





Use images of the real plane to help you sand it to shape and paint.

