

# ***Lockheed*** ***STARFIGHTER*** ***Parkjet***



## **Construction Guide**



# Mirage 2000 History

The Lockheed F-104 Starfighter is a single-engine, supersonic interceptor aircraft which later became widely used as an attack aircraft. It was originally developed by Lockheed for the United States Air Force (USAF), but became widely used by US Allies around the world, and produced by several other NATO nations. One of the Century Series of fighter aircraft, it was operated by the air forces of more than a dozen nations from 1958 to 2004. Its design team was led by Kelly Johnson, who went on to lead or contribute to the development of the Lockheed SR-71 Blackbird and other Lockheed aircraft.

The F-104 set numerous world records, including both airspeed and altitude records.

Its success was marred by the Lockheed bribery scandals, in which Lockheed had given bribes to a considerable number of political and military figures in various nations in order to influence their judgment and secure several purchase contracts; this caused considerable political controversy in Europe and Japan. Germany was very interested in the British Saunders-Roe SR-53 Rocket interceptor but the F104 was controversially selected - this Lockheed coup, known as the "Deal of the Century", caused major political controversy in Europe and the West German Minister of Defence Franz Josef Strauss was almost forced to resign over the issue. During later investigation into Lockheed's business practices, it was discovered that Lockheed had paid out millions of dollars in "sales incentives" in each of these countries in order to secure the deal. Prince Bernhard of the Netherlands confessed to taking more than one million dollars in bribes from Lockheed to buy the F-104.

The poor safety record of the Starfighter also brought the aircraft into the public eye, especially in German Air Force service. Fighter ace Erich Hartmann was forced to retire from the Luftwaffe due to his outspoken opposition to selection of the F-104.

The ultimate production version of the fighter model was the F-104S, an all-weather interceptor designed by Aeritalia for the Italian Air Force, and equipped with radar-guided AIM-7 Sparrow missiles. An advanced F-104 with a high-mounted wing, known as the CL-1200 Lancer, was considered but did not proceed past the mock-up stage.

Nicknames: Zipper; "Missile With A Man In It"; Witwenmacher "Widowmaker" (Bundesluftwaffe nickname); Flying Coffin; Ground Nail; Bullet & Blades; Badmash "Wicked One" (Pakistani nickname for F-104As), Eiko "Glory" (Japanese nickname for F-104Js), Spaghetti Starfighter (Italian nickname for F-104S-ASAs.)

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# Designers Notes

The starfighter is such an iconic design looking like a rocket with the tiny anhedral wings, it looks more like it was created in science fiction.

I've made a few changes to the original design in order to help it fly ok as an RC model. Namely I've reduced the anhedral slightly and enlarged the wings a little. They are only slight changes and you would be hard-pressed to spot the changes.

Designed for both up to 70mm EDF or Pusher prop configuration, it will need have a fast hand launch to get enough air flowing under the wings.

If you enjoy this design please help me to fund my next project and send a donation for \$10 to Paypal address :-

[clicketyclarkstone@gmail.com](mailto:clicketyclarkstone@gmail.com)

Thank you! and happy flying.

Craig :)



**Construction**

# Before you start.



## Adhesives

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

## Tapes

- > For holding parts tightly together whilst glue sets
  - Low tack masking tapes
- > For leading edges, hinges, general strengthening
  - 3M Gift tape (Purple - not green one!) - I prefer lightweight plastic hinges.
- > For decals
  - Coloured parcel tapes (strips taped to waxed paper & cut out)

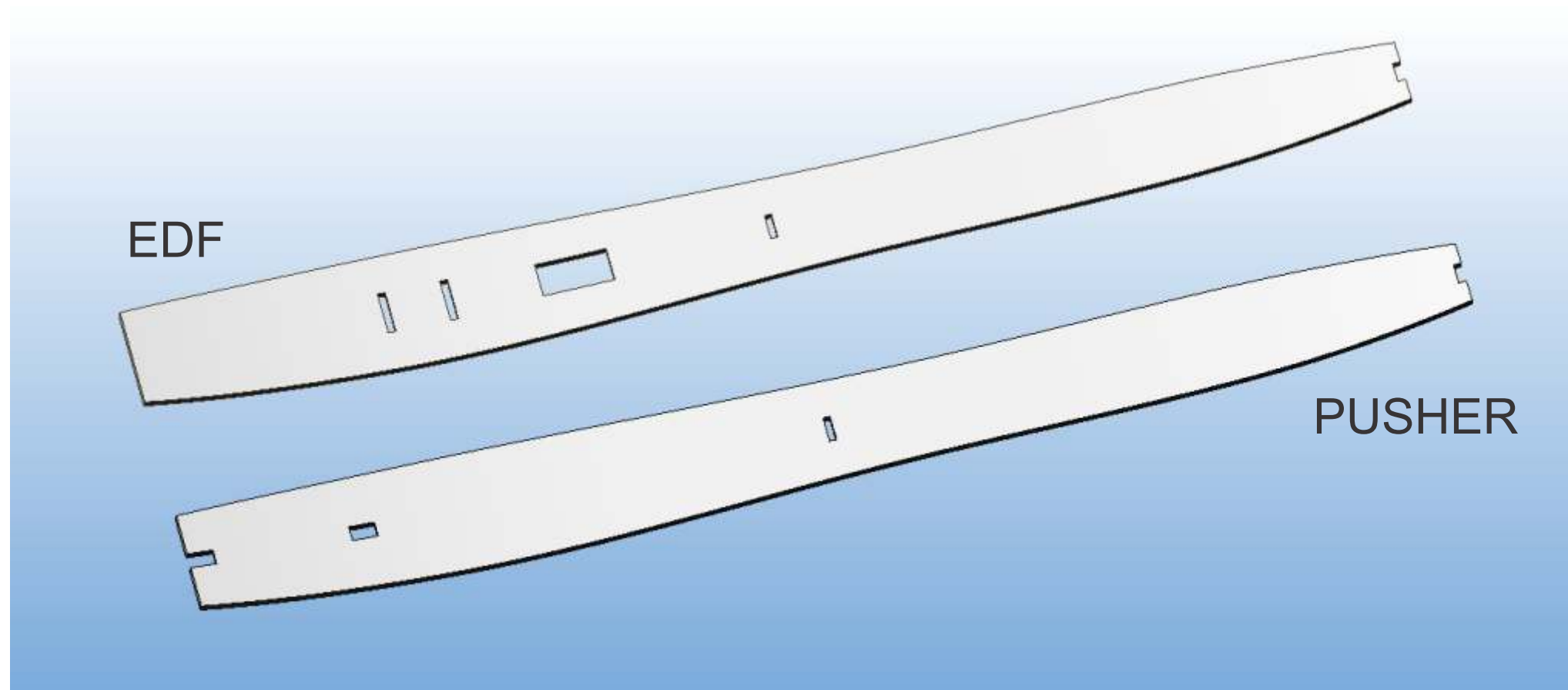
## Cutting parts

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.

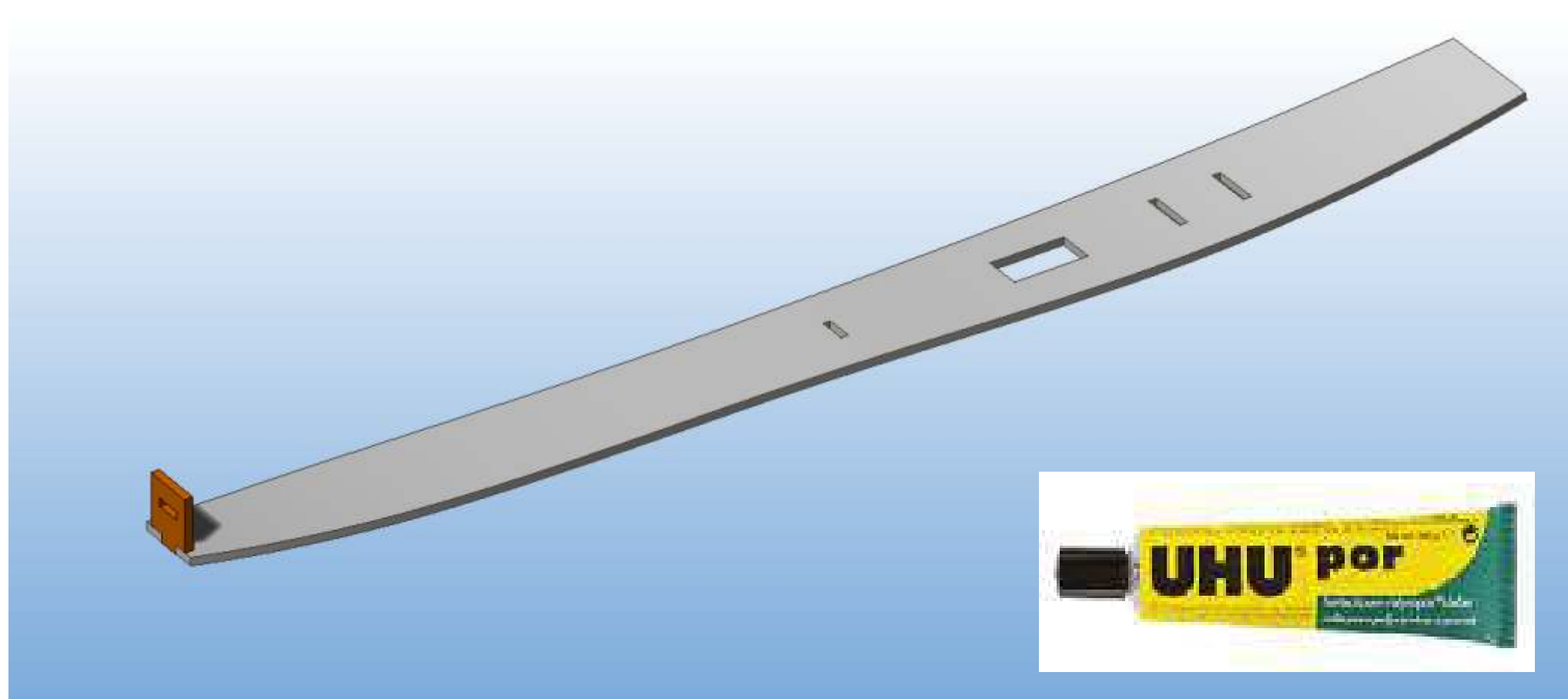
1. Ensure a really good fit - this will reduce the amount of adhesive used. The Bar Sander is a great tool for this.
2. Follow the adhesive instructions closely.
3. Use ordinary steel head pins to help keep the parts located whilst epoxy sets.
4. Use objects as weights such as paperweights to apply pressure 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 prevents the glue protruding and gives a nice finish.



CHOOSE :-

Make a choice - what type of power system you will power your Starfighter with? It can fit up to 70mm EDF.

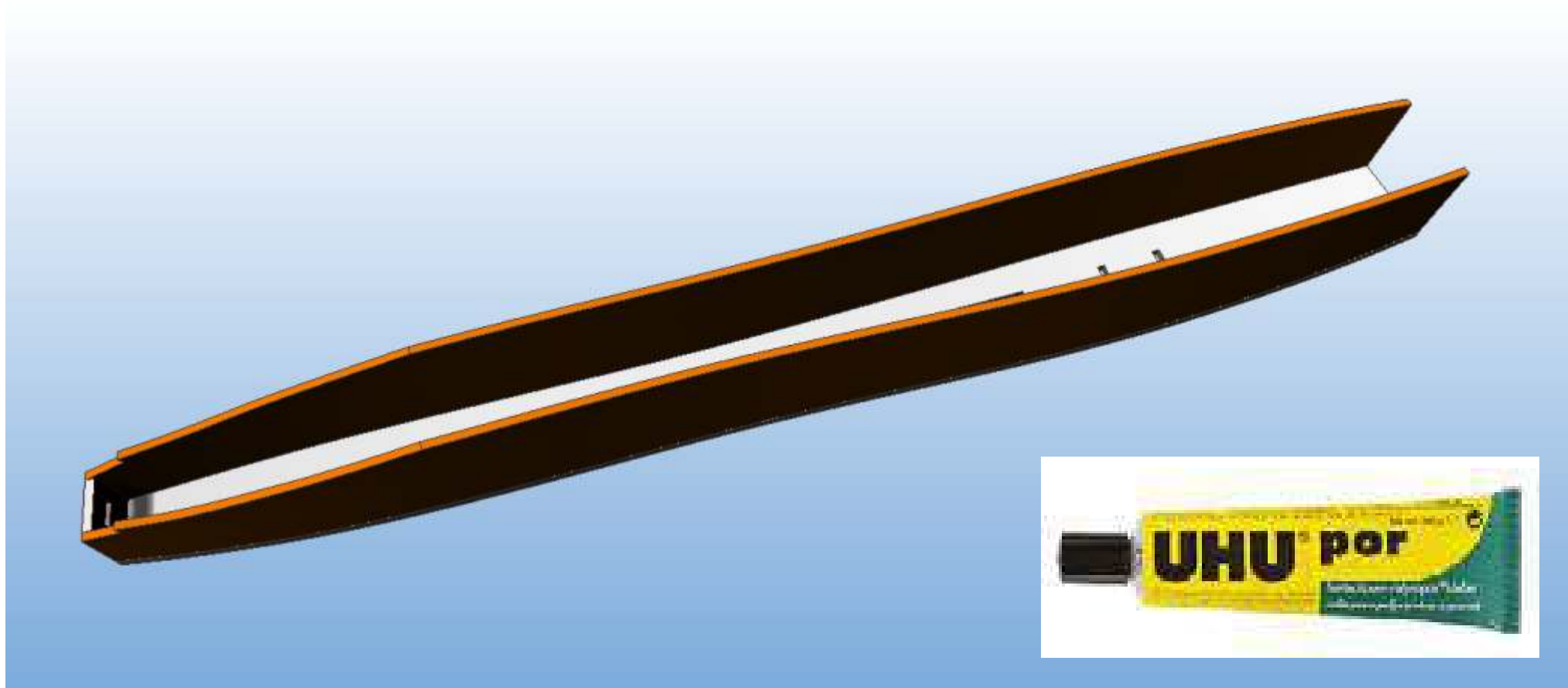
Cut out the Inner belly panel according to your power type.



Glue bulkhead 1 to the Inner Belly panel as shown.







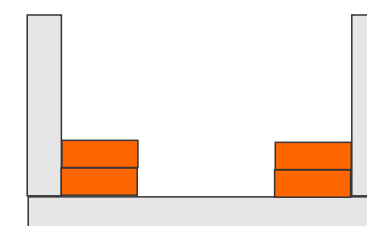
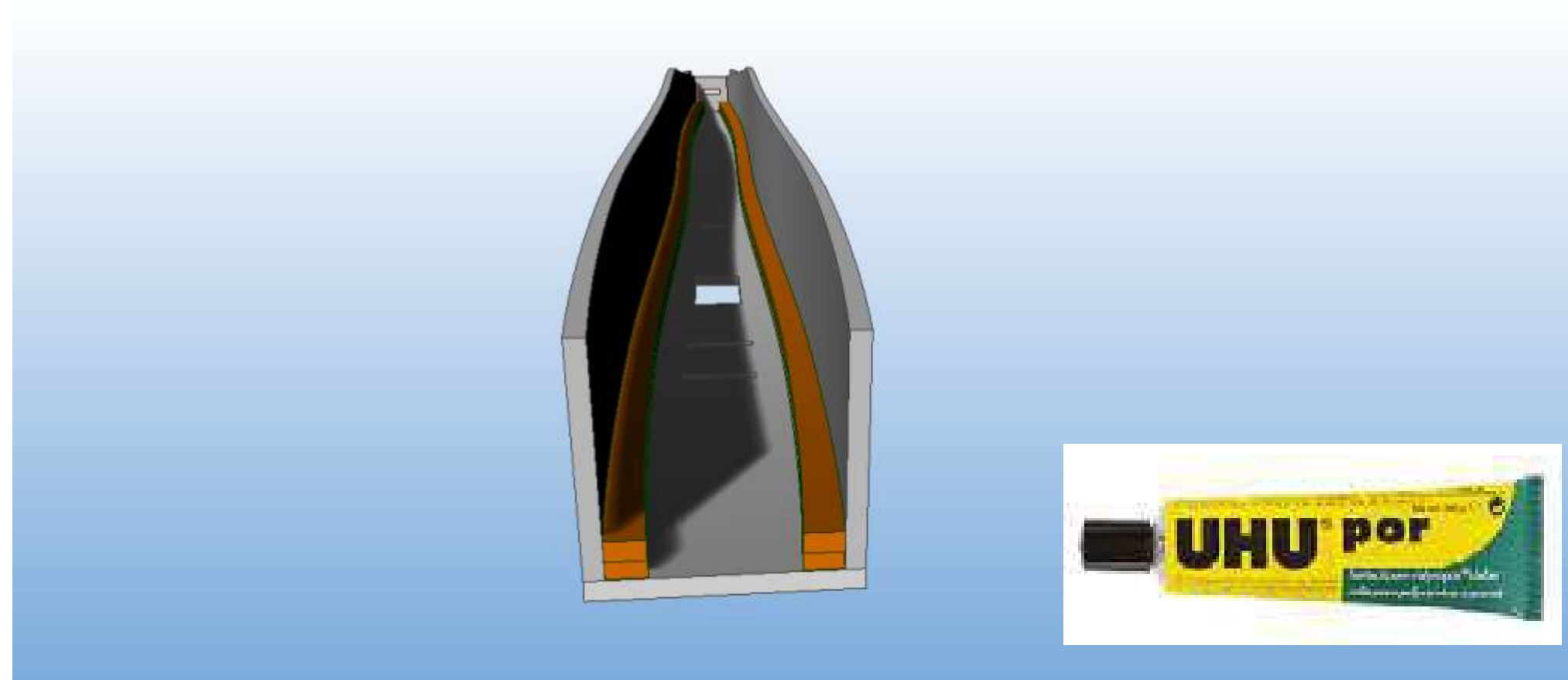
# CHOOSE:

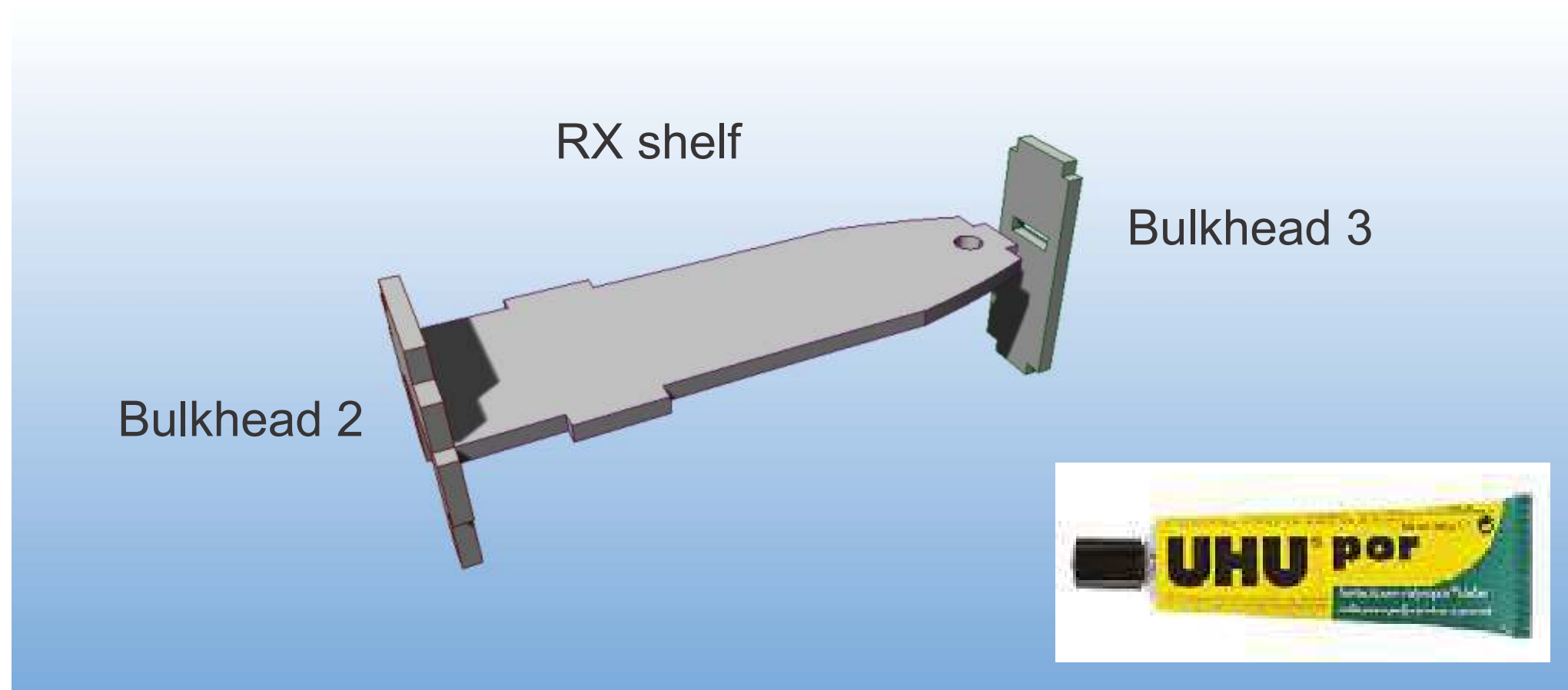
Decide if you want a single or double canopy and then cut the appropriate Inner fuselage side panels. Glue the sides to the top as shown in the diagram below. It is done this way to help achieve the overall shape.



Glue the four 12mm wide x 6mm depron corner reinforcement strips into the corners as shown.

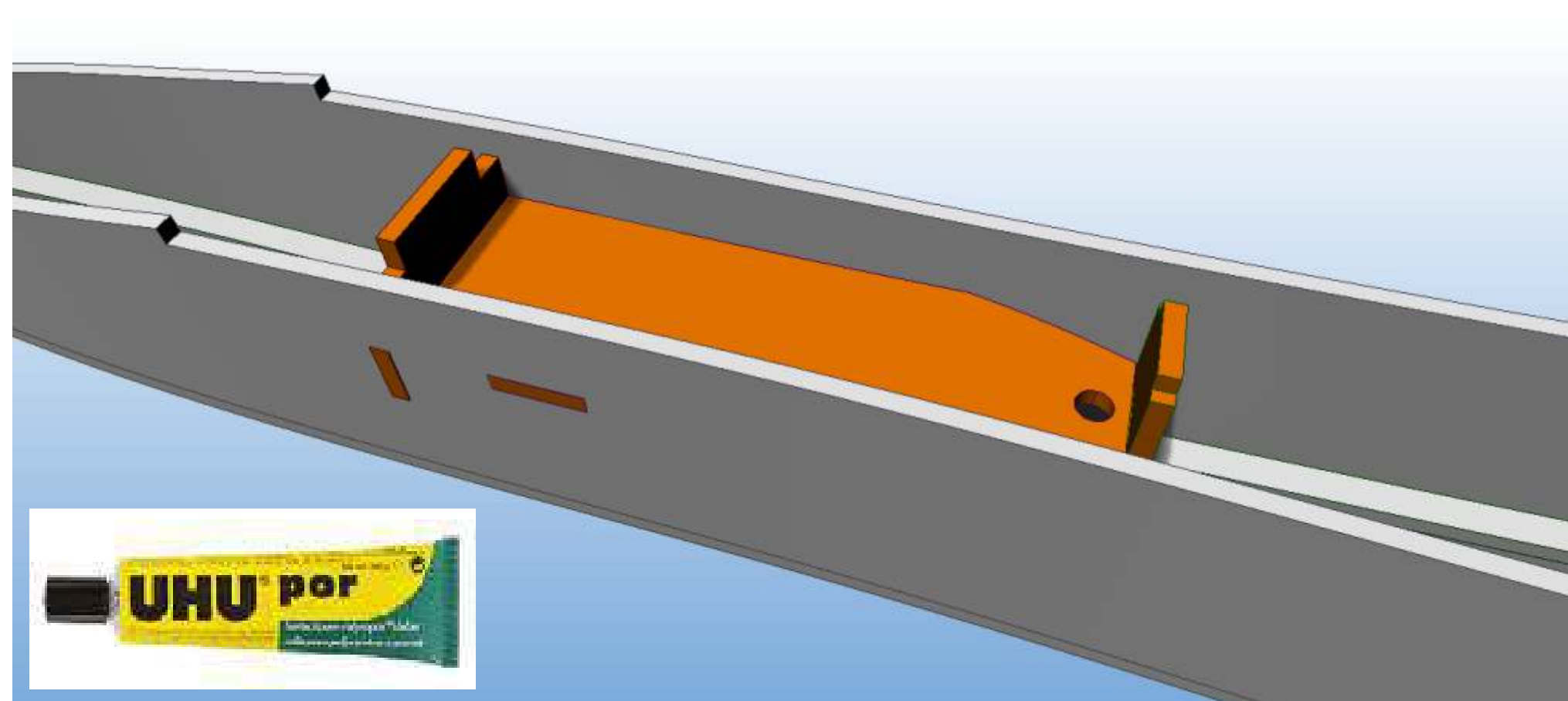
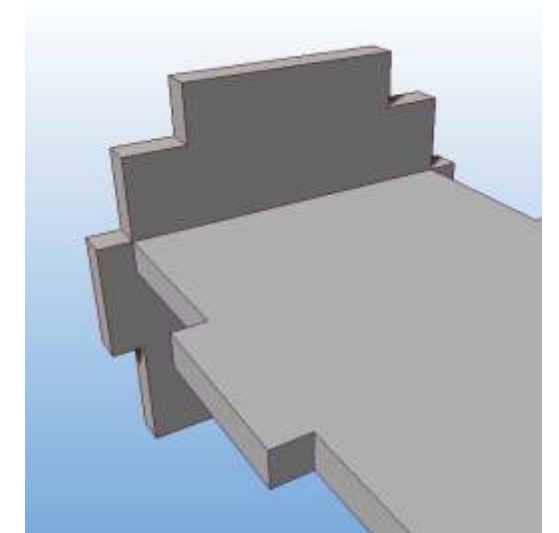
Lay them into the corner one strip at a time





Glue together the 3 parts shown opposite.

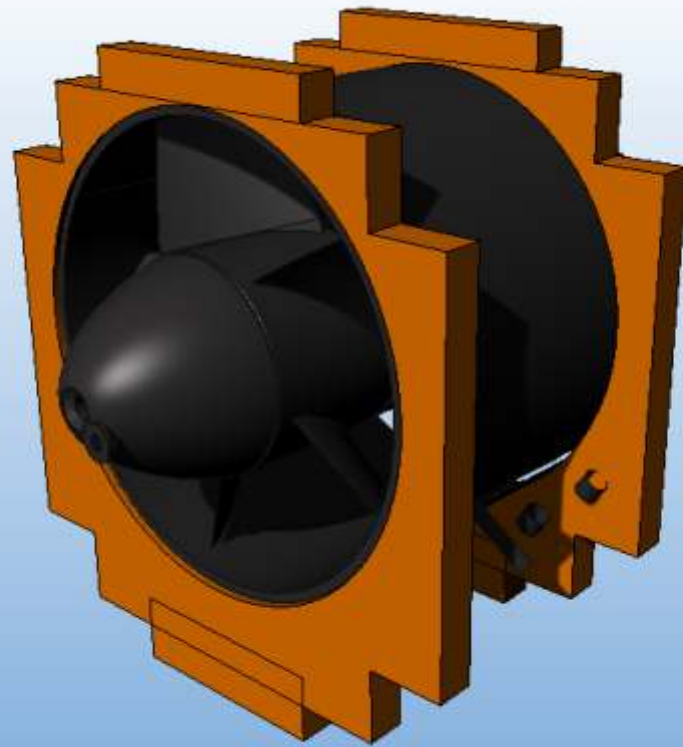
Butt Joint the RXshelf to bulkhead 2 exactly in line with the two external tabs - see below.



Glue the assembly into the fuselage by gently pulling the fuselage sides apart. The Tabs should locate into the slots provided.



EDF ONLY



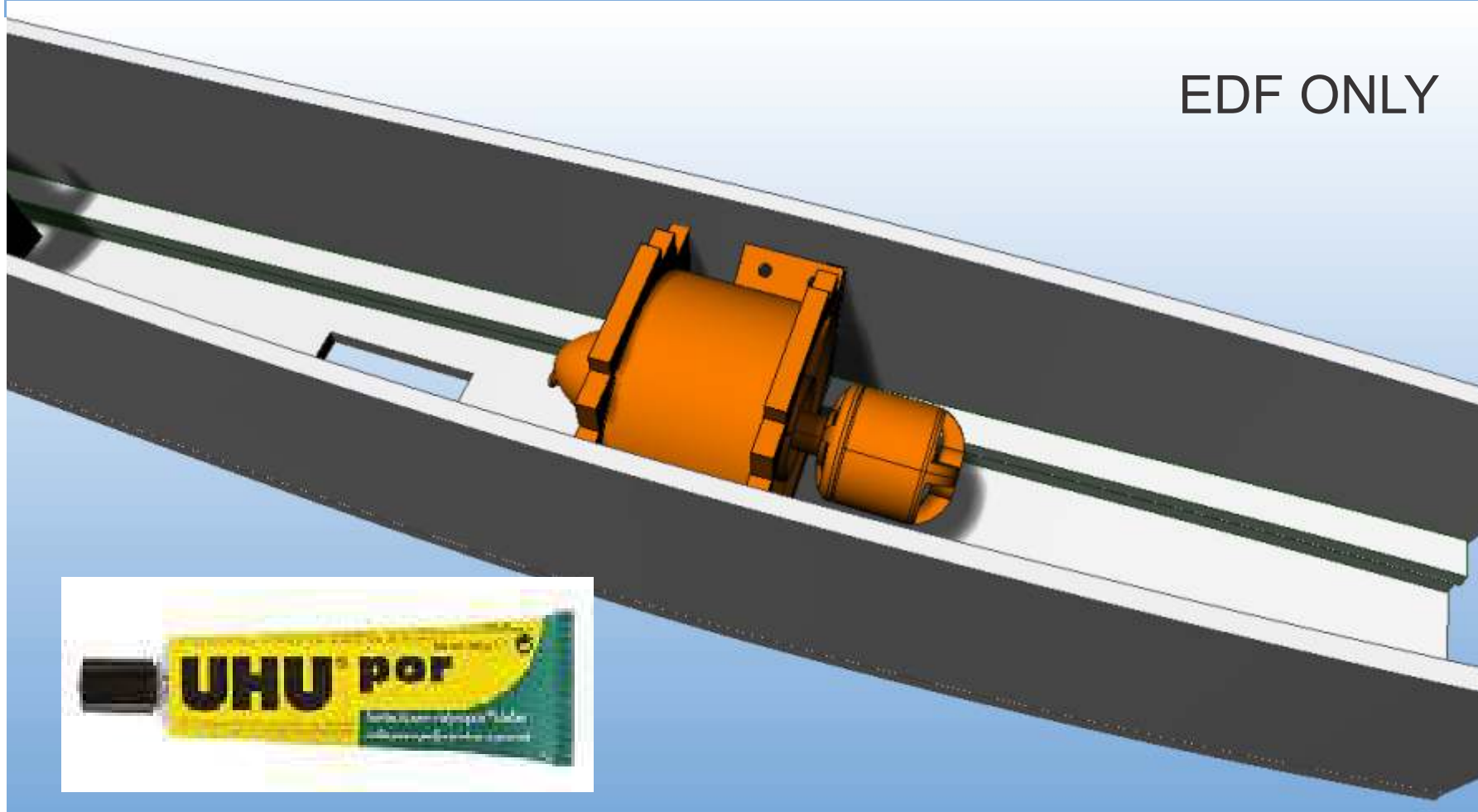
Adjust the EDF mount bulkheads to suit your particular EDF size and shape (maintaining the central axis)

Using hot melt glue or silicone sealant (for noise dampening), glue the front and rear EDF mount bulkheads to the EDF unit so that they align with the slots in the fuselage

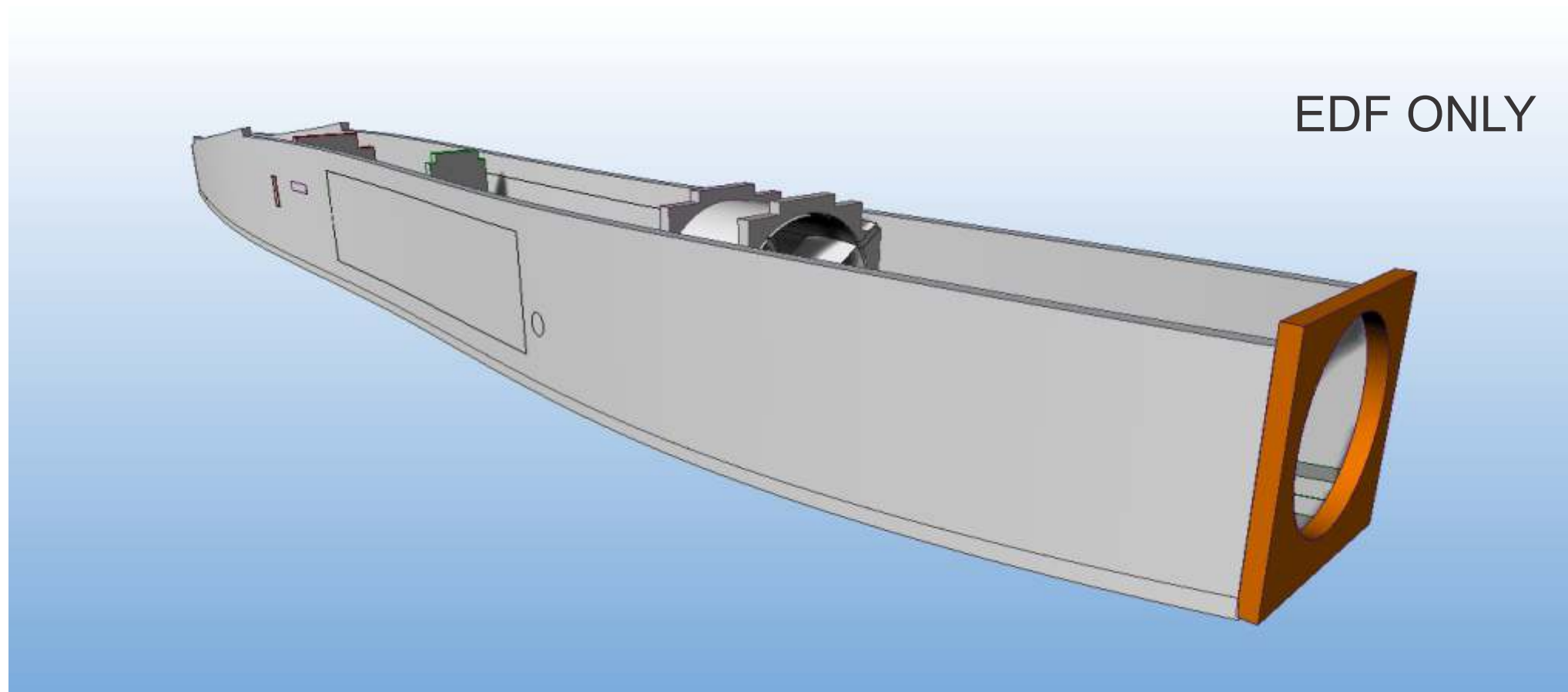


Glue the EDF motor assembly into the fuselage as shown.

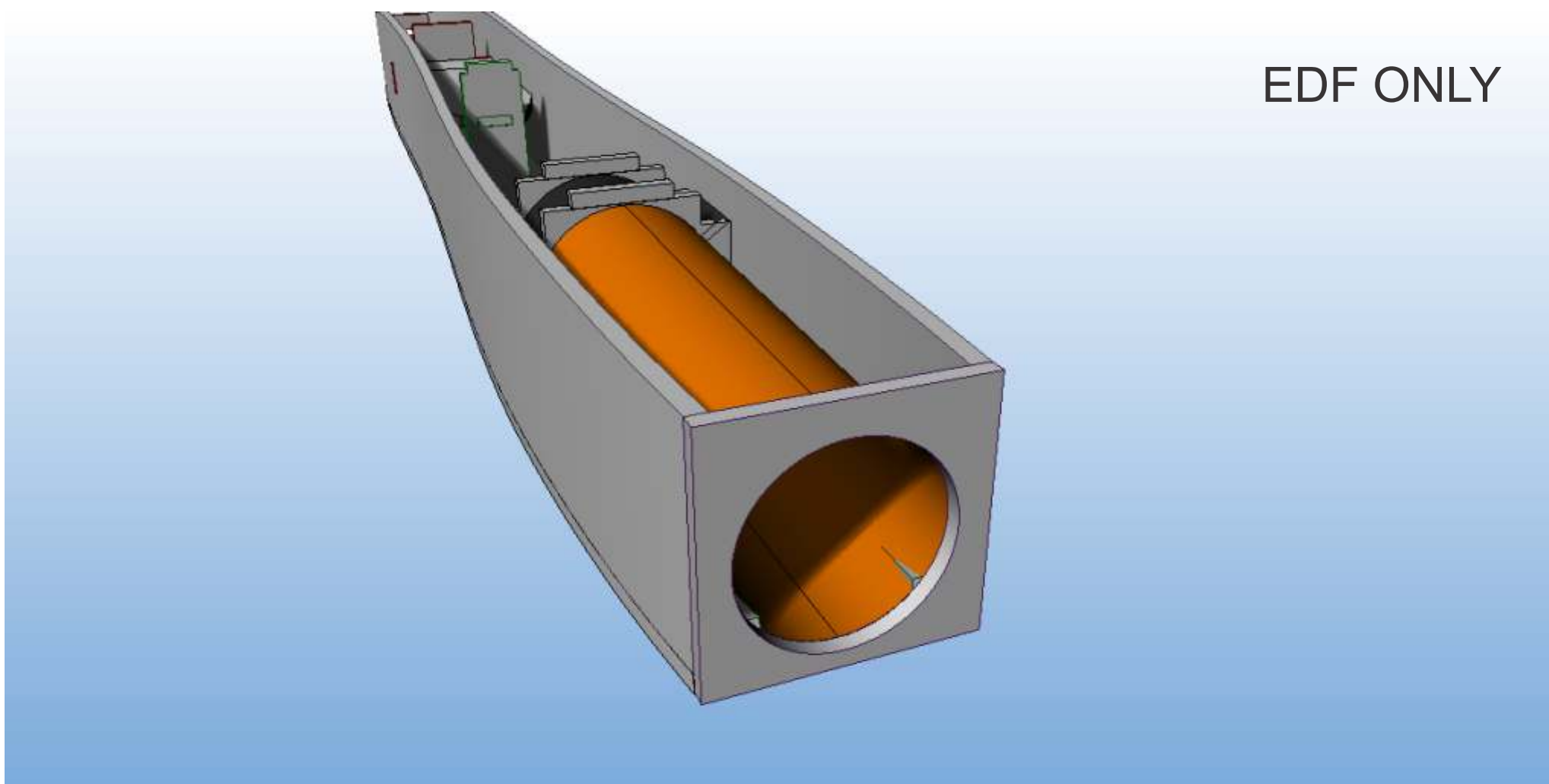
EDF ONLY







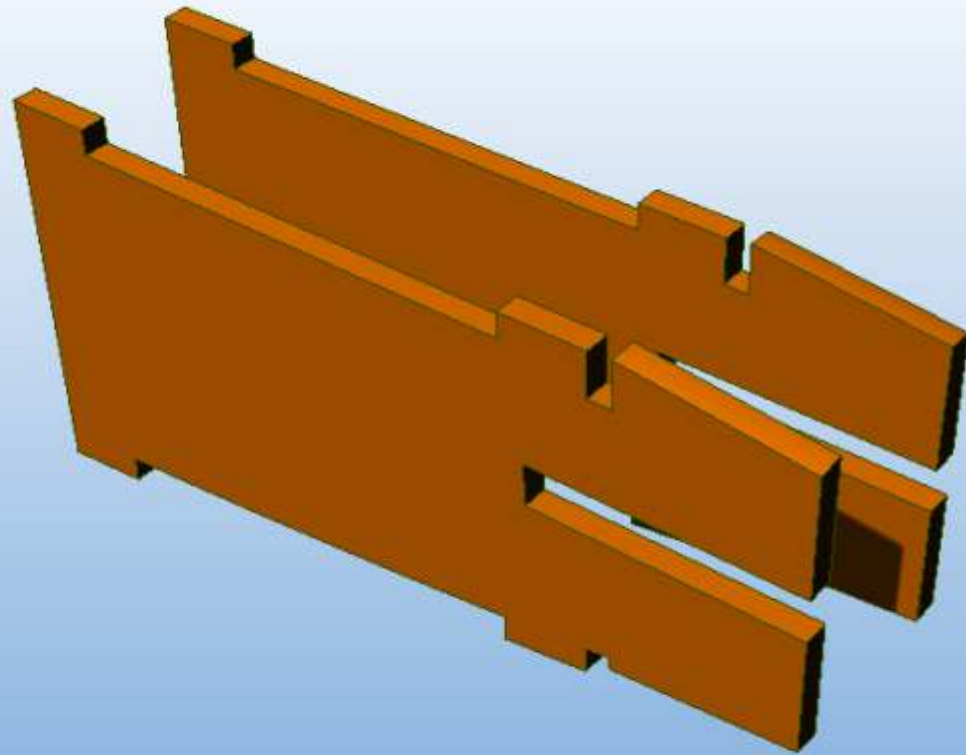
Glue the exhaust bulkhead to the rear of the assembly.



Create an EDF Thrust tube to span between the EDF and exhaust bulkhead from plastic sheet and nylon reinforced tape. Glue the EDF thrust tube in place carefully using hot-melt glue.



## PUSHER ONLY

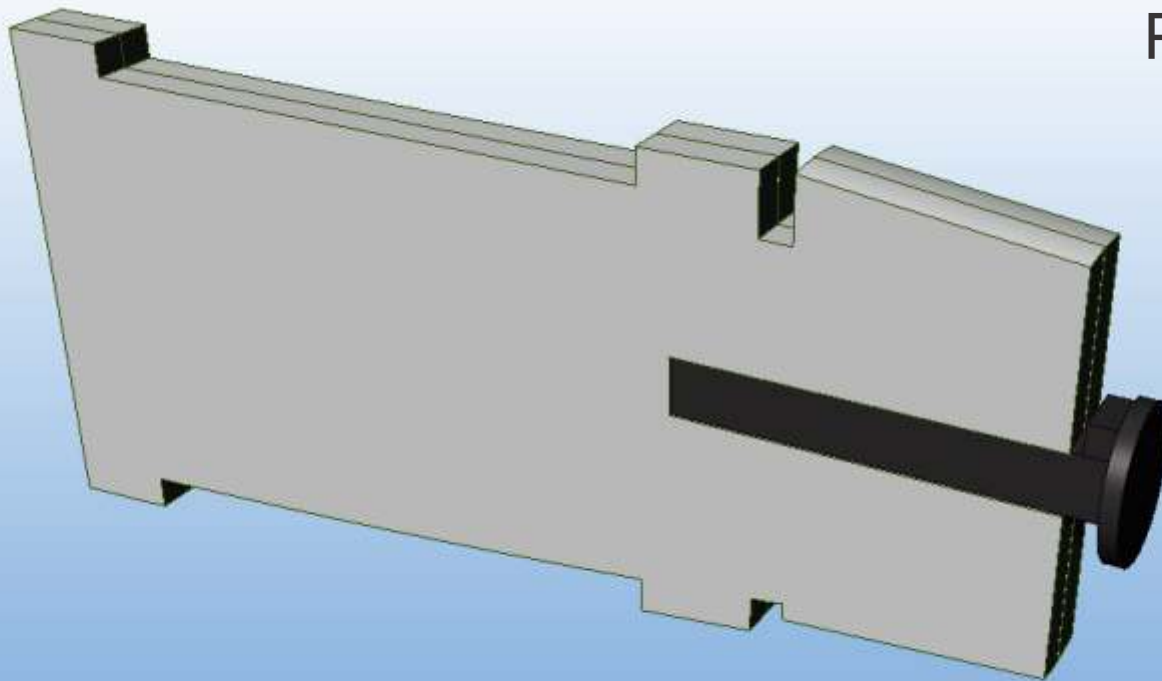


## PUSHER INSTALLATION ONLY.

Glue together the 2x pusher mount pieces together using UHU por.



## PUSHER ONLY

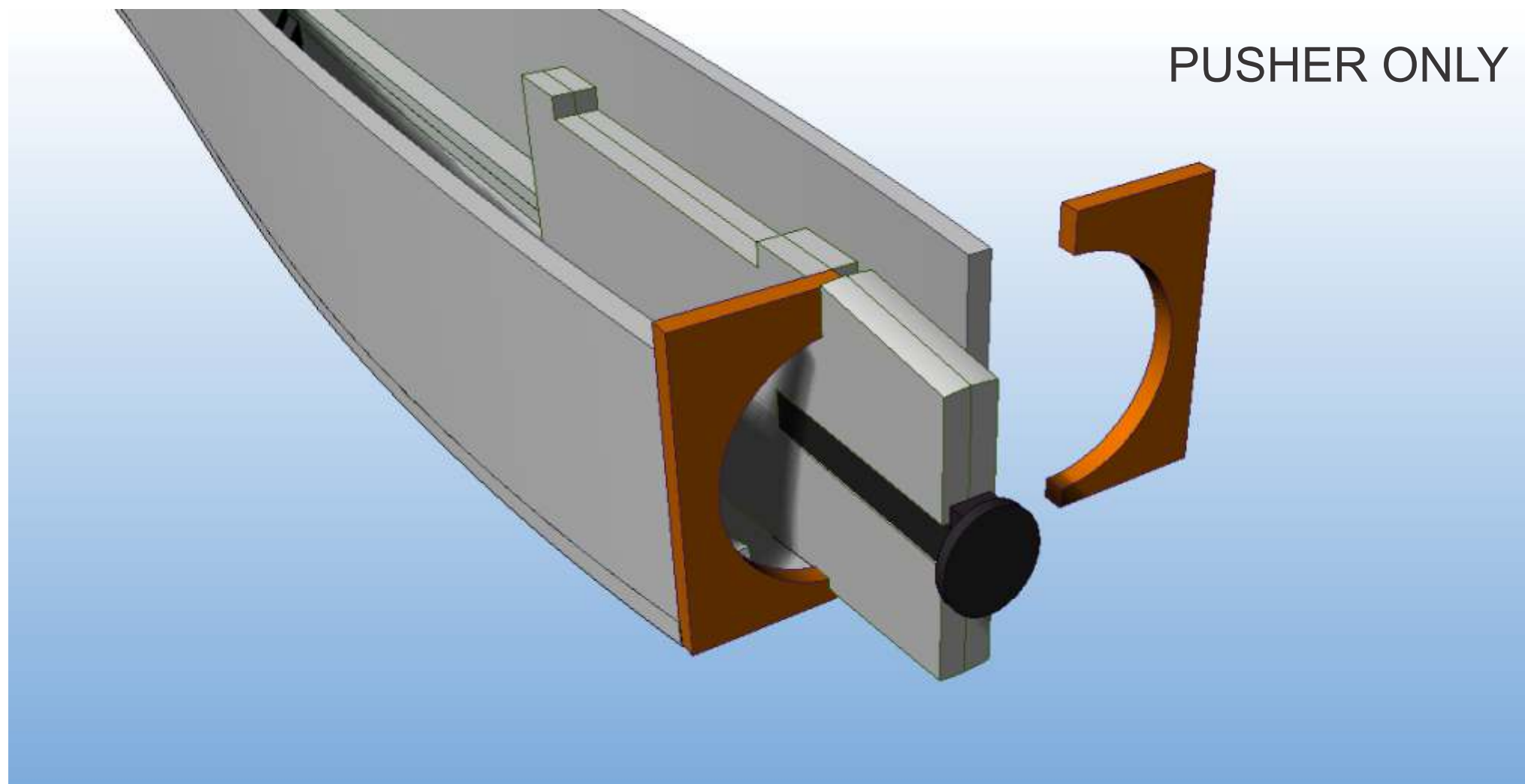


Glue the motor stick mount into the motor mount using hot melt glue.

Hobbyking - SKU:OR004-00602



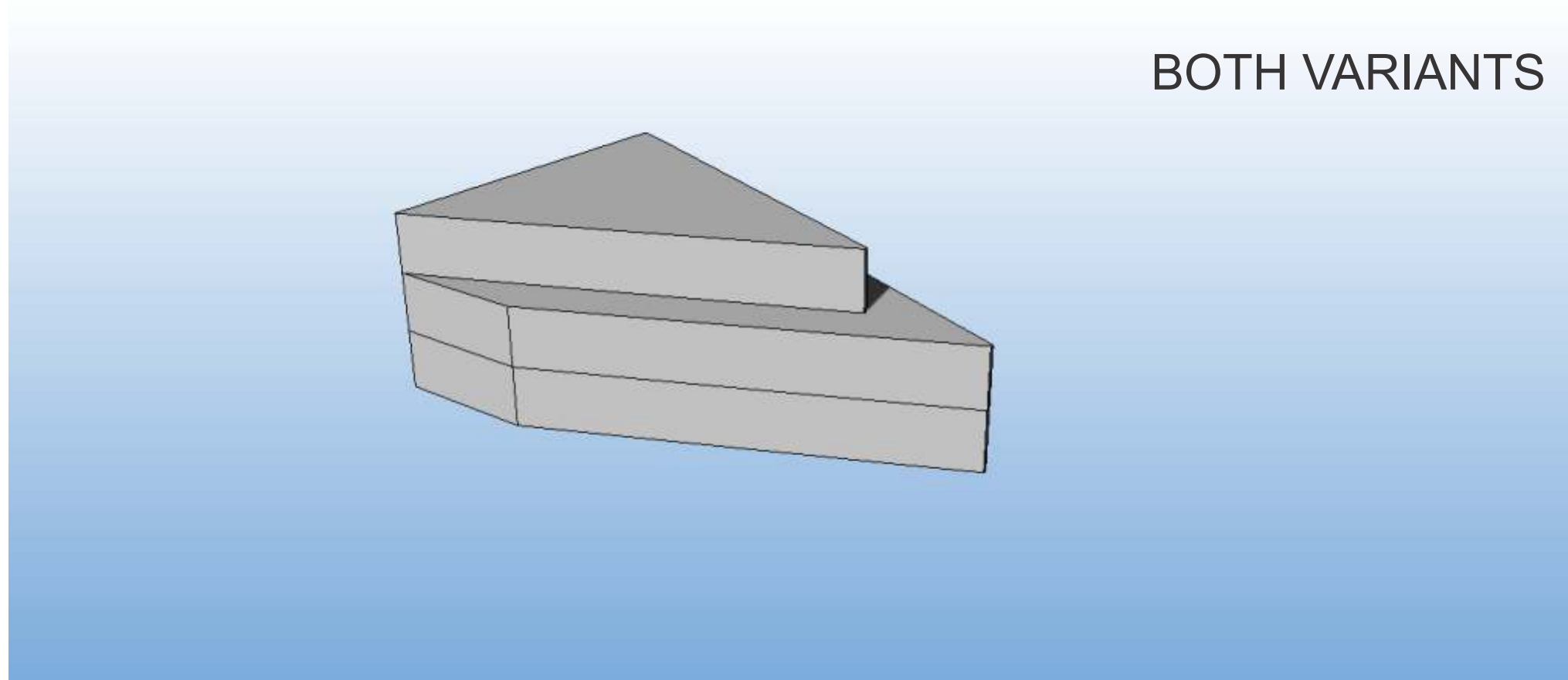




## PUSHER ONLY

Glue the Pusher motor mount assembly to the fuselage in the prepared slots.

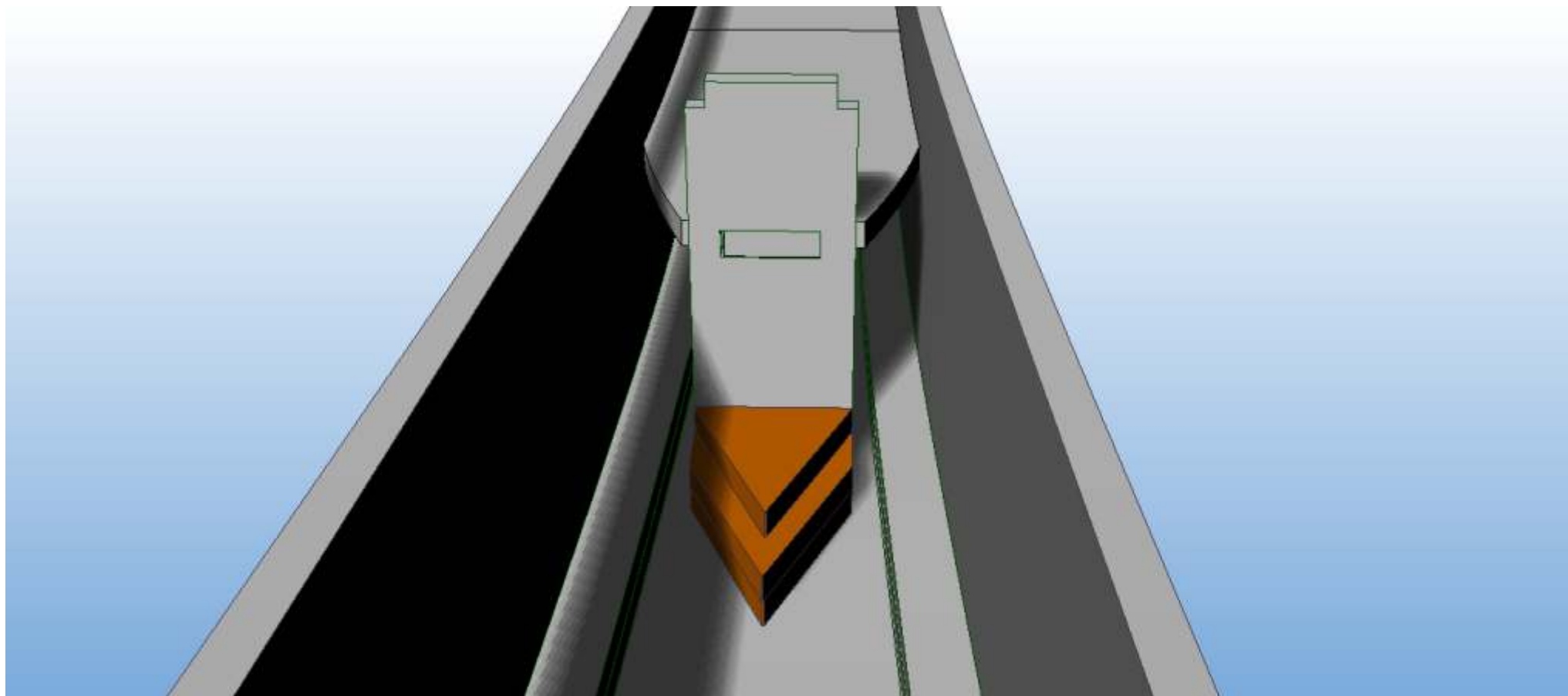
Then cut the Exhaust bulkhead in half along the centreline and glue to assembly as shown.



## BOTH VARIANTS

Glue together the lower intake taper supports as shown.



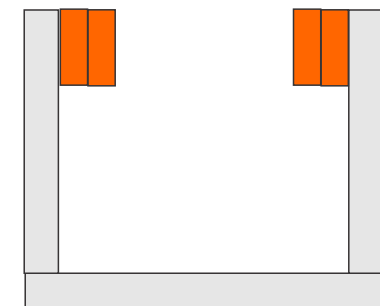
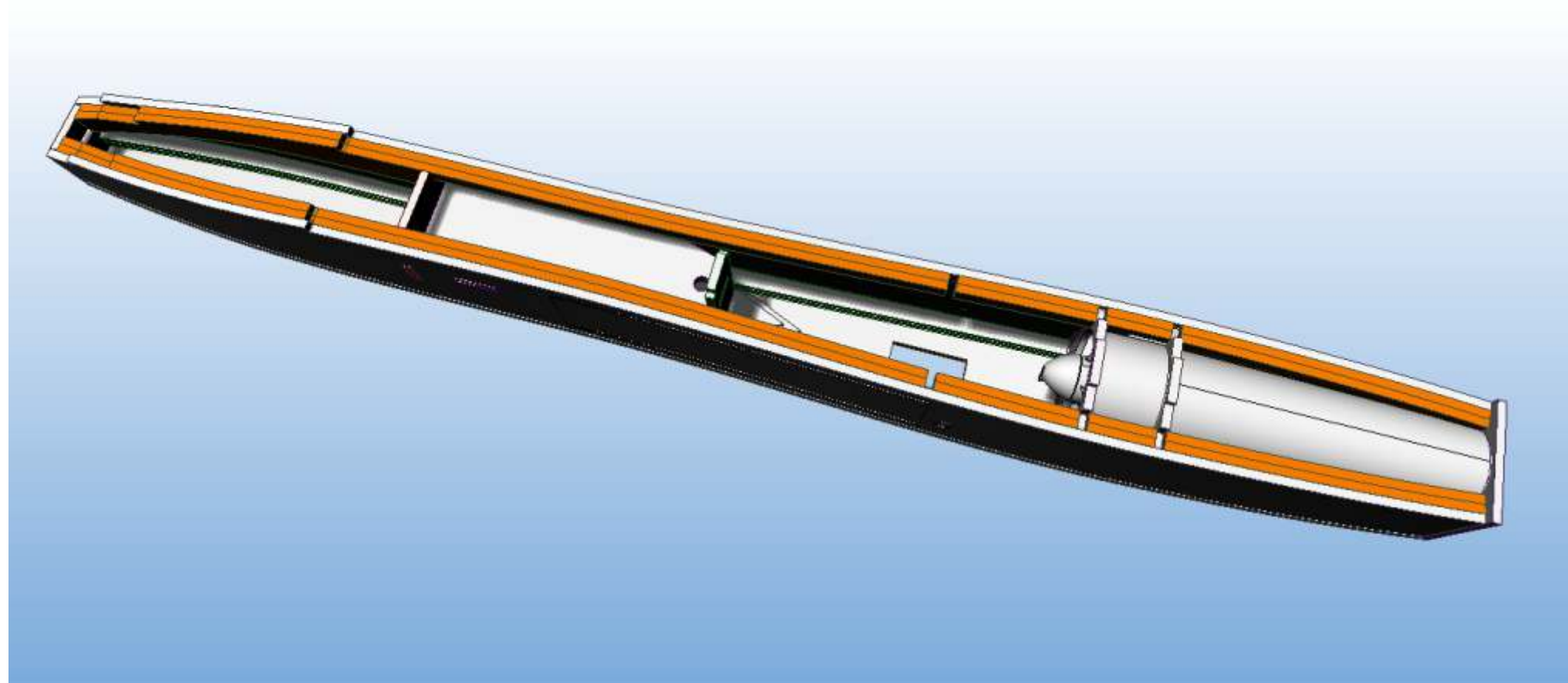


Glue the lower intake taper support block to the rear lower face of bulkhead 3 as shown.

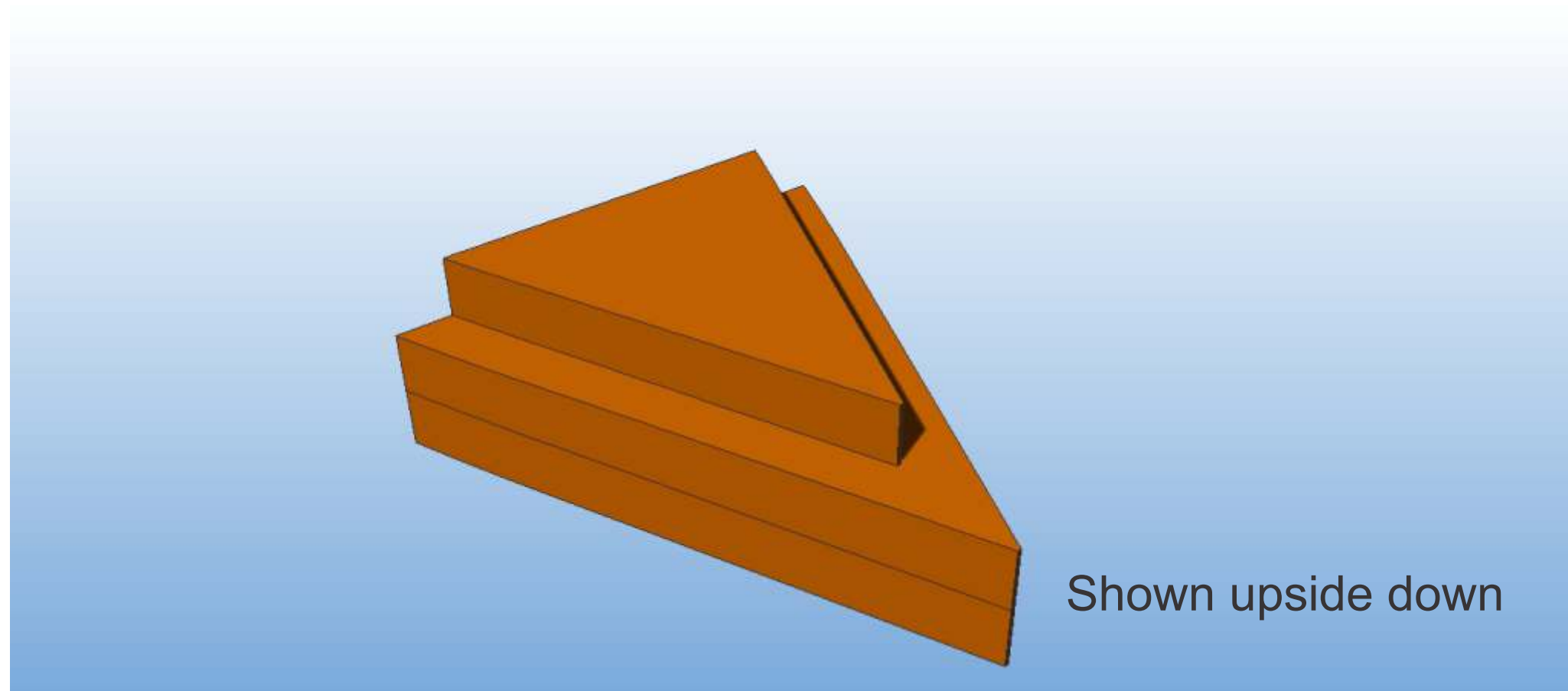


Glue the upper corner reinforcers in as shown. Make special attention to the cut positions around the EDF mount bulkheads and in preparation for the Plywood bulkhead (in the coming pages).

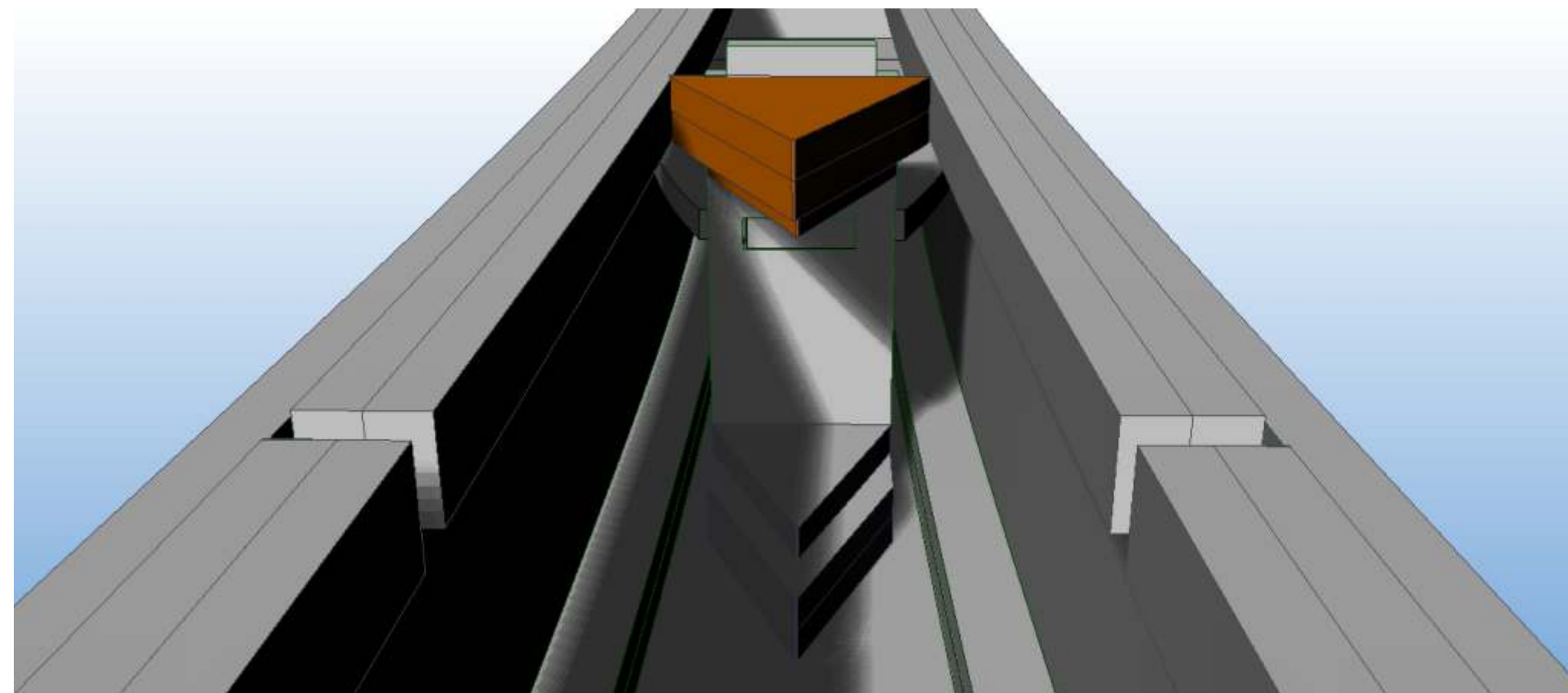
NOTE. these are NOT 12mm strips - see parts sheet for more info.







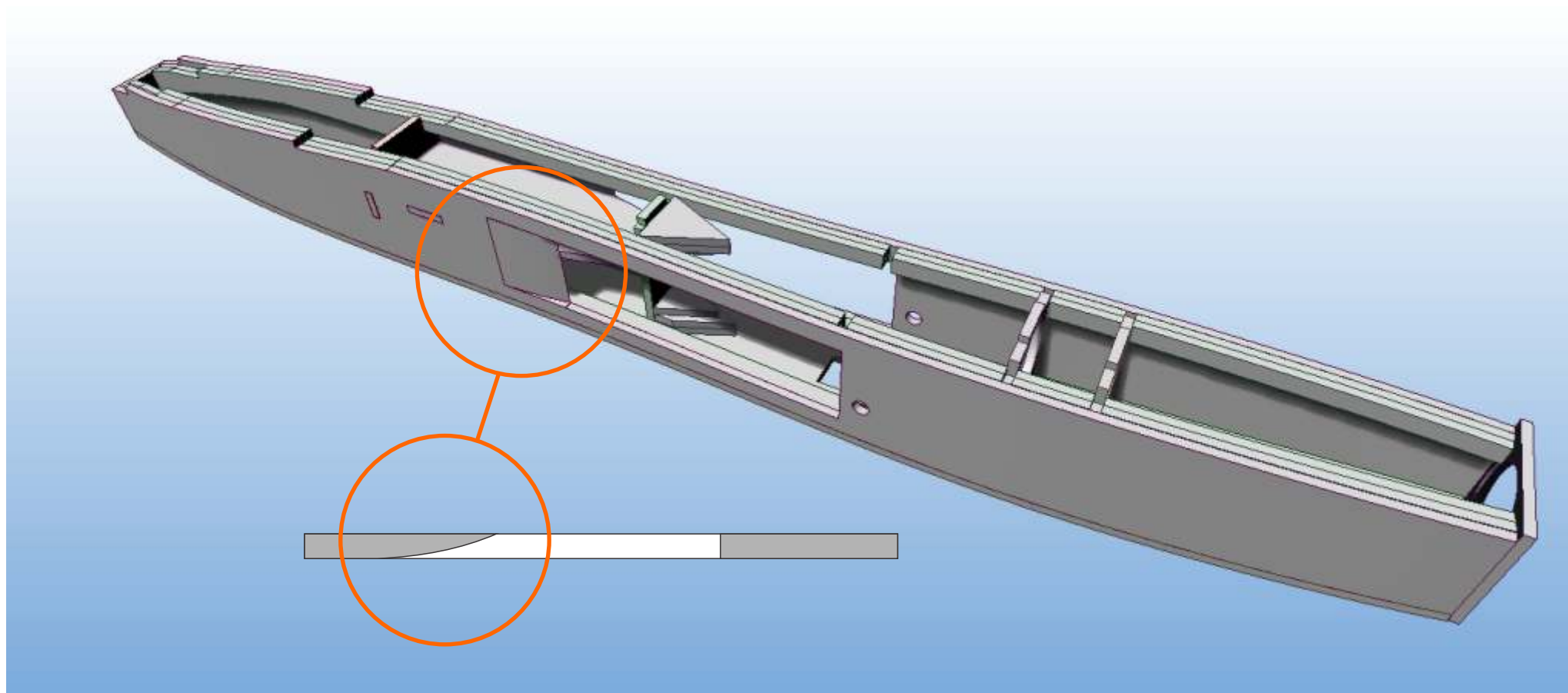
Glue together the upper intake taper supports as shown.



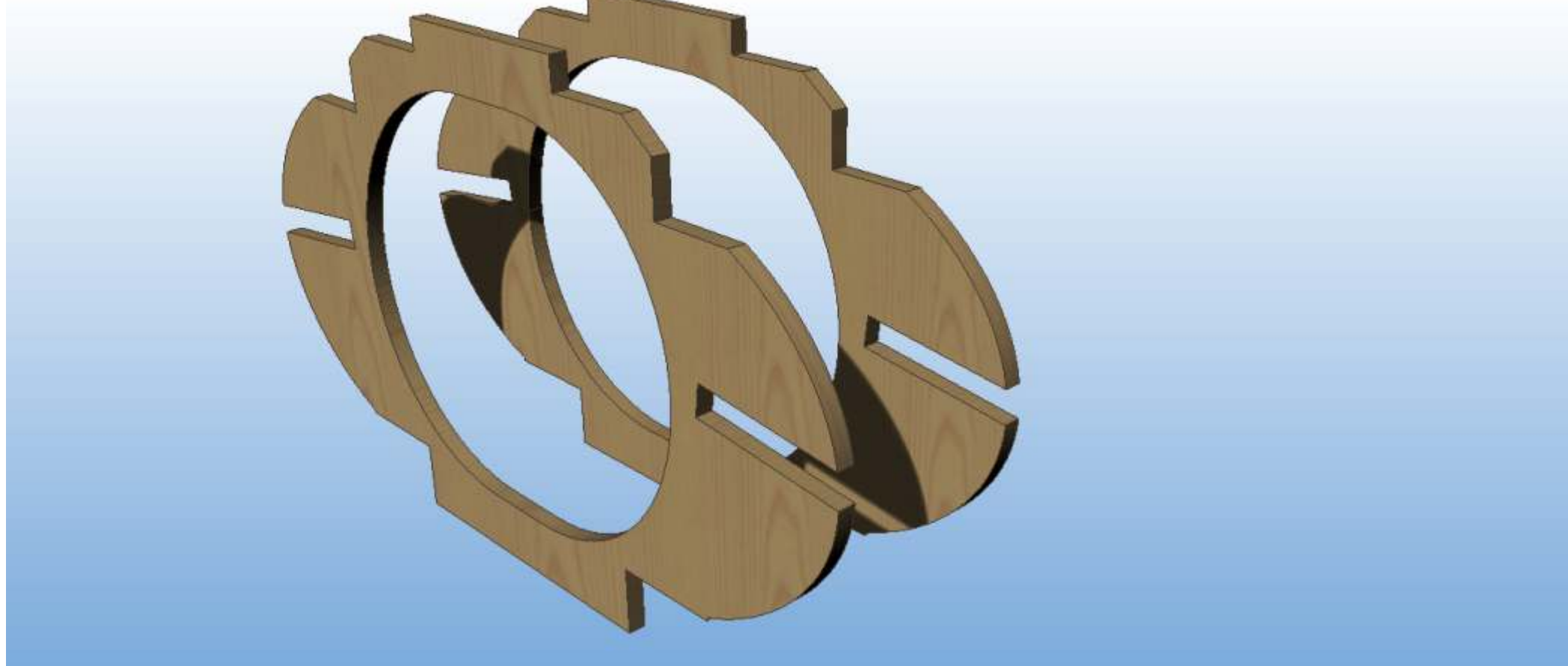
Ensure that when positioned against bulkhead 3 that the top surface is aligned with the top face of the fuselage. Glue to the Bulkhead.

NOTE: This part will also later be glued to the upper fuselage inner face.





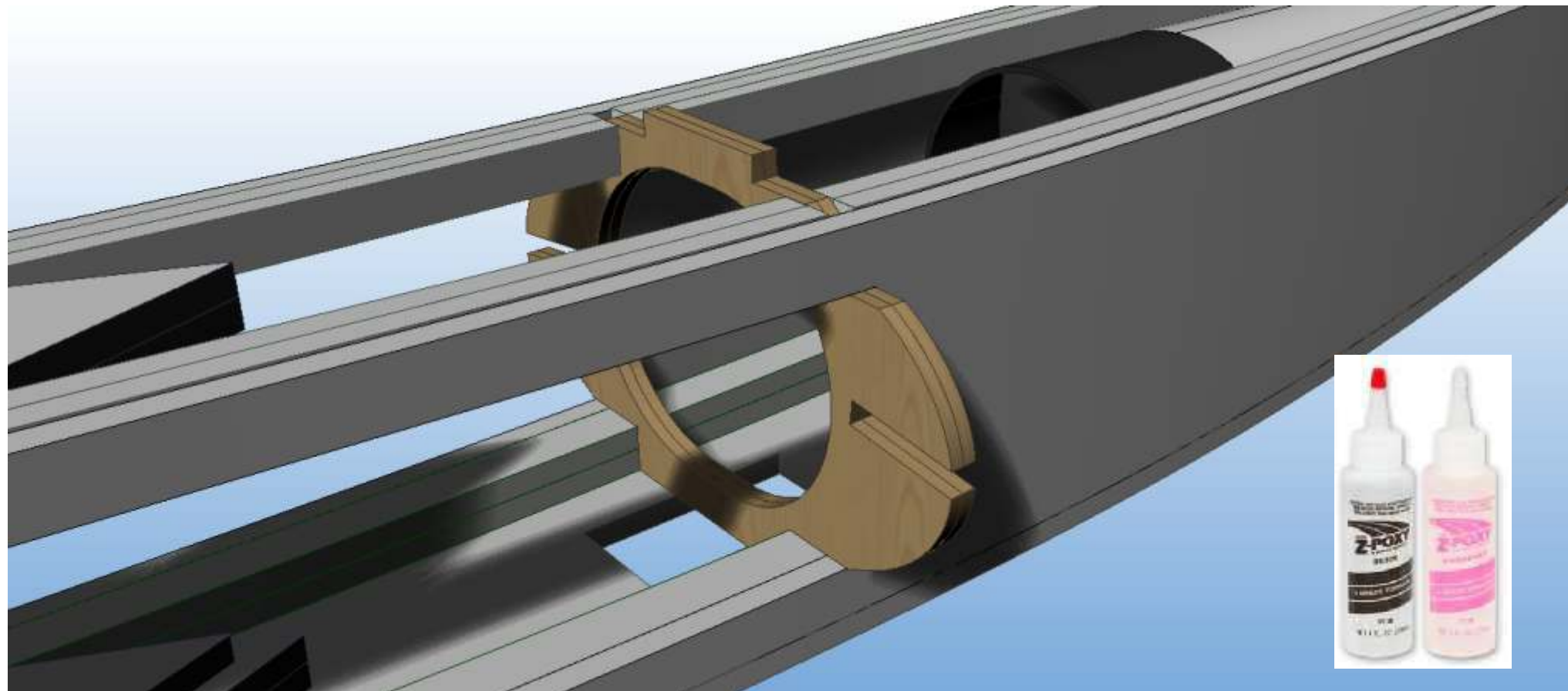
Carefully trim away the sides as shown. Carefully sand a tapered edge along the front as shown.



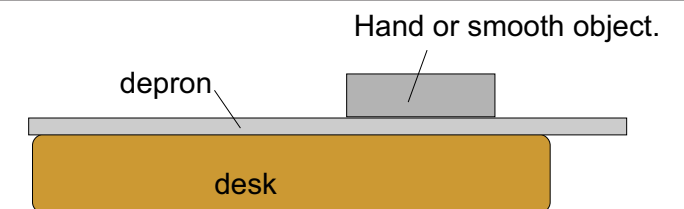
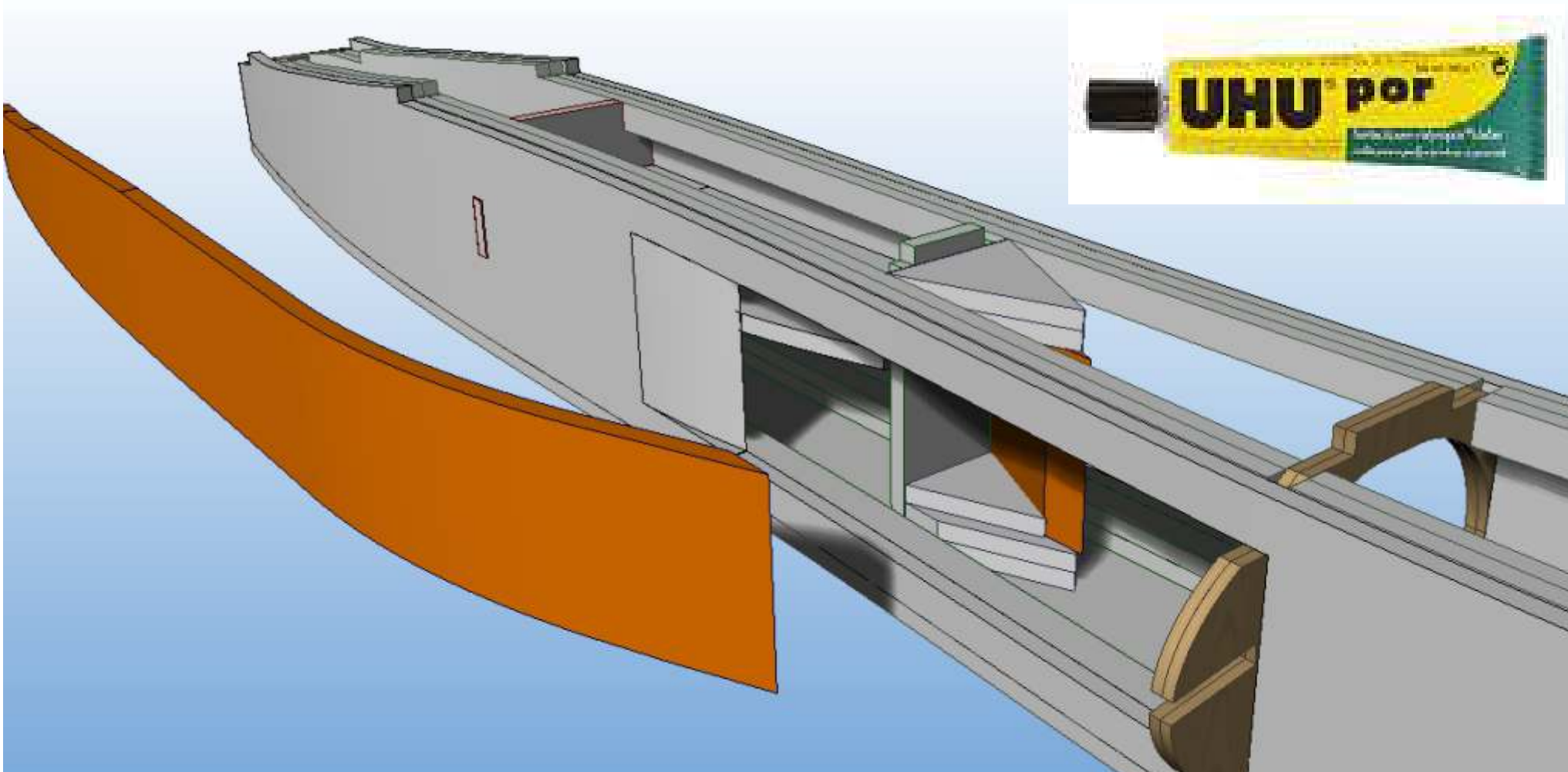
Glue together the two plywood structural bulkheads as shown.



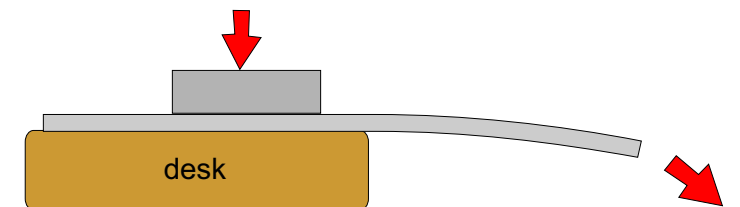




Carefully manoeuvre the structural bulkhead in place. Gluing using Epoxy.



1. Place over edge of desk. firmly press down on the depron 75mm (3") from the edge of the desk.



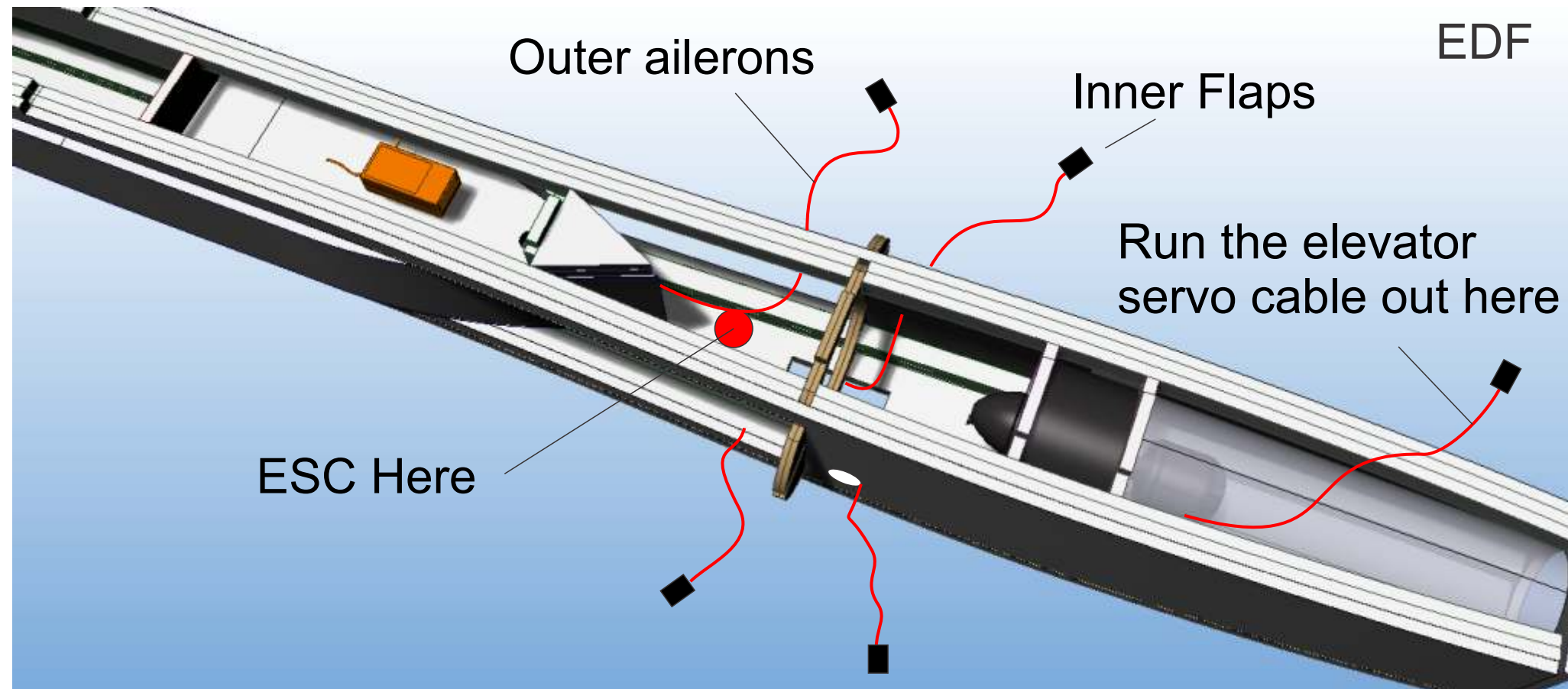
2. Whilst still pressing down, Drag the depron over the edge of the desk, pulling down as you go. This motion will put a nice curl in the depron.

Test fit the Outer forward fuselage sides, Align to the locator marks at the front of the fuselage. Sand the fuselage if needed to get a good fit.

Glue both sides in place.







## CHOOSE :-

If you want split Ailerons/Flaps or Ailerons with flaps mixed in. This will dictate how many servos you want, and where they will be. For split flaps/Ailerons, you will need two servo extension cables running through the fuselage side hole on each side.

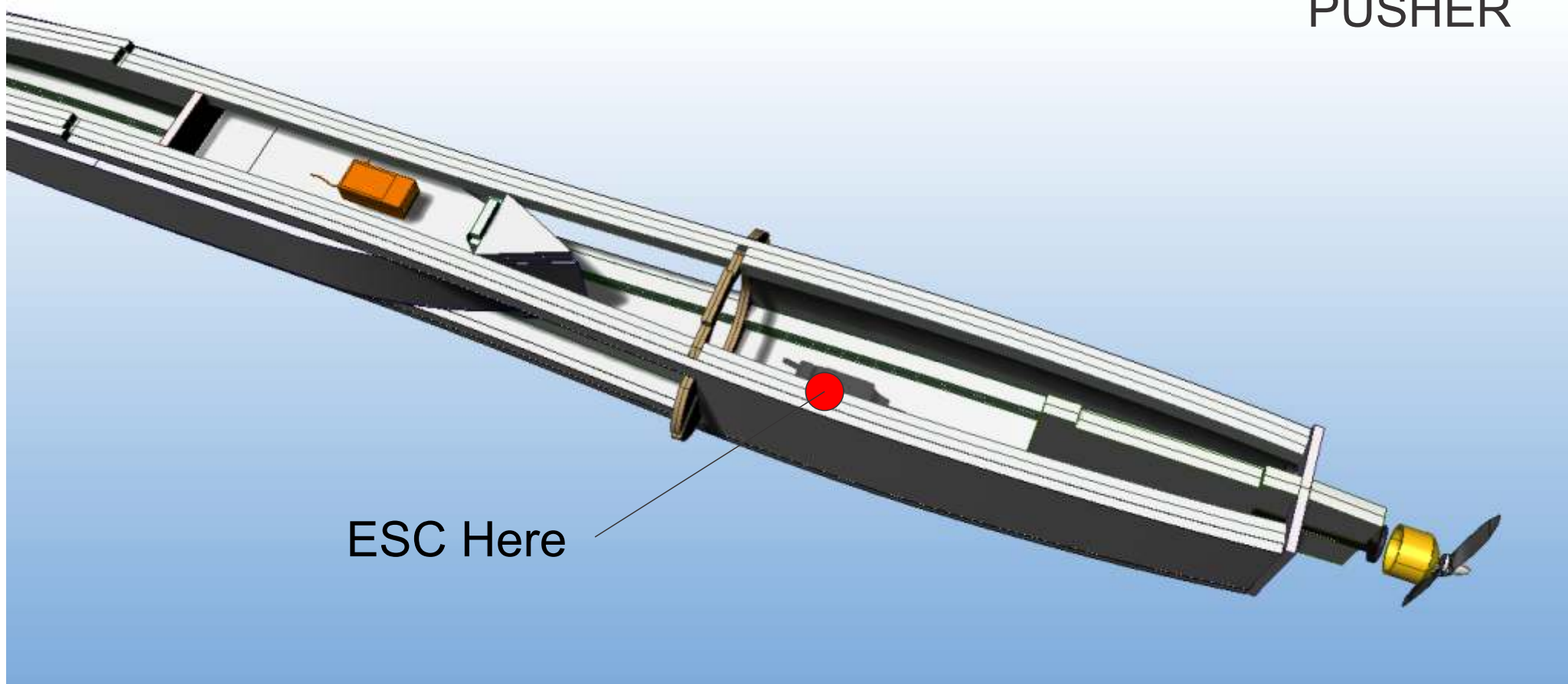
Connect all the electronic pieces. Run the Battery > ESC cables either side of the lower tapered Intake support pieces.

Run the ESC > EDF cables under the wooden Structural bulkhead.

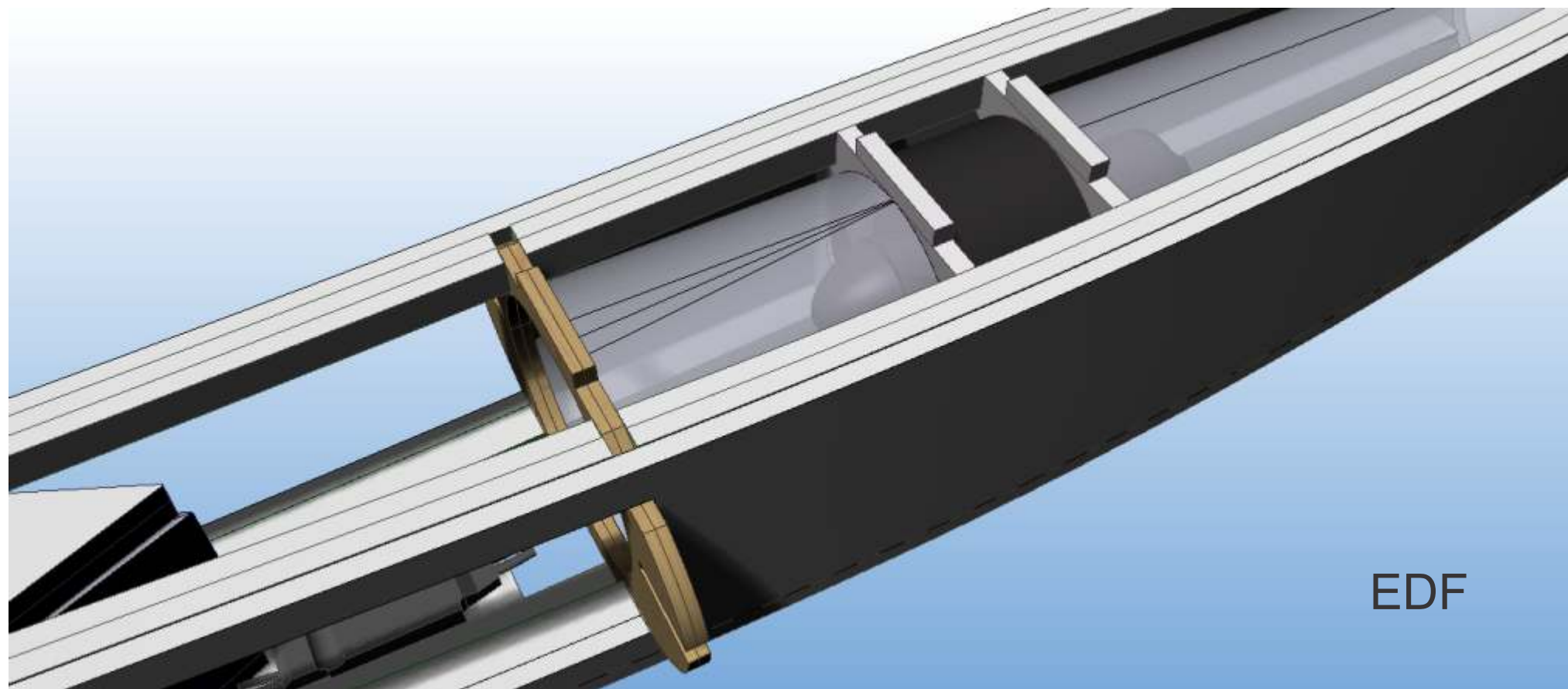
Run the Servo cables along the floor of the fuselage along the side of the tapered support pieces (with the power cables)

Connect the Pusher version in the same fashion, running the cables all the way to the motor at the back. Position the ESC equidistant from the battery to the motor.

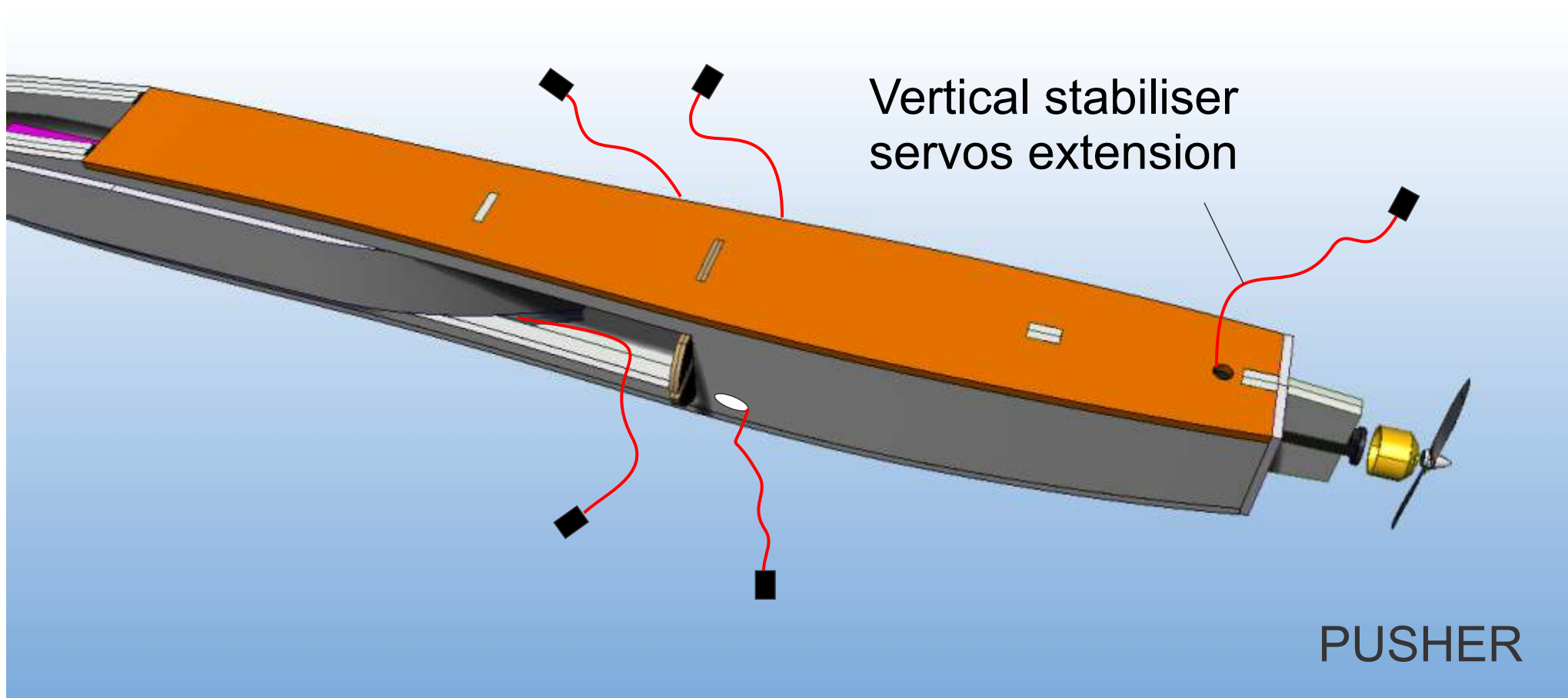
TEST all the Electronics.







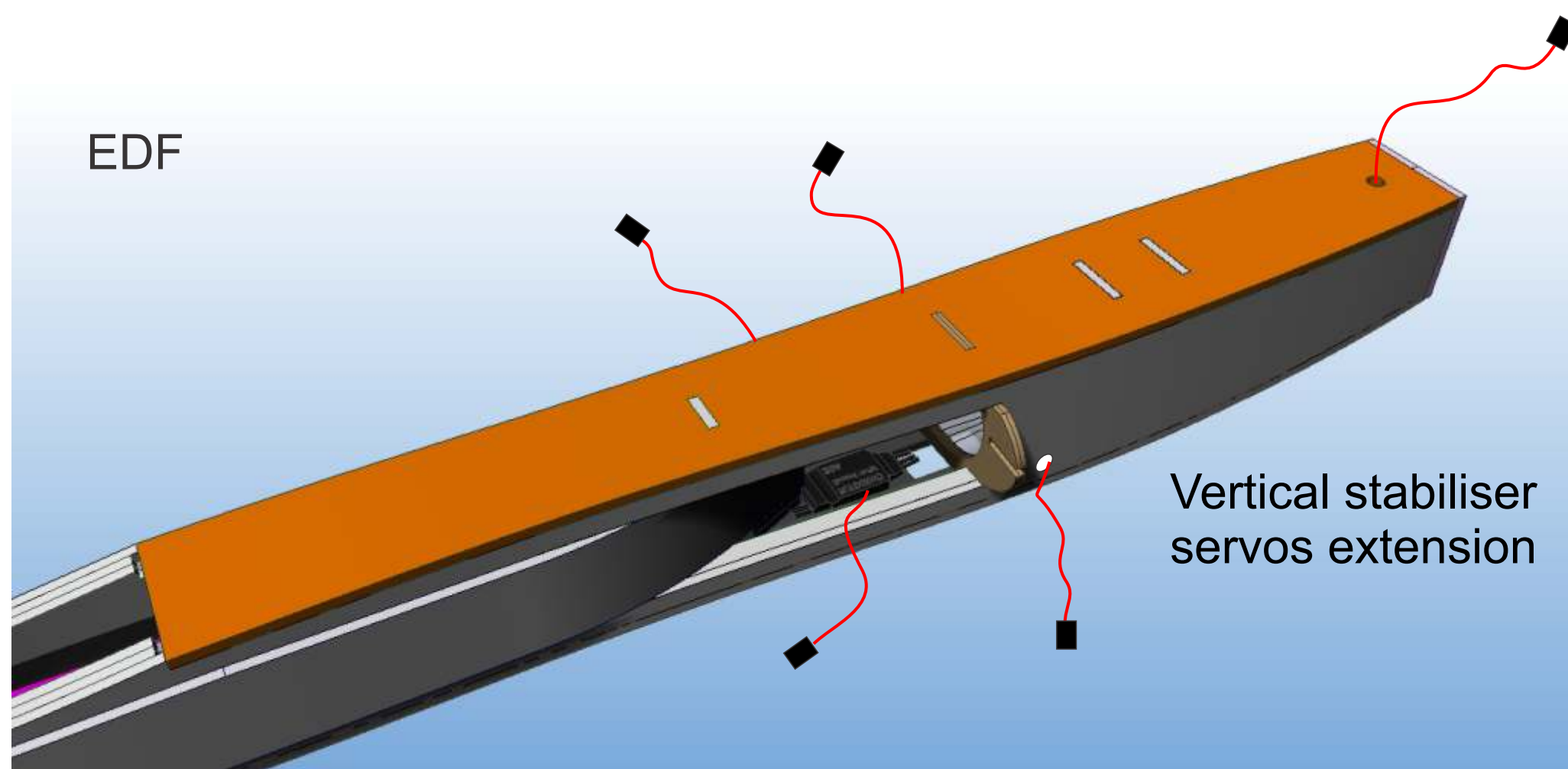
Glue the forward air intake duct in place between the wooden structural bulkhead and the forward face of the EDF unit.



Glue the Fuselage Top (Inner) to the assembly.

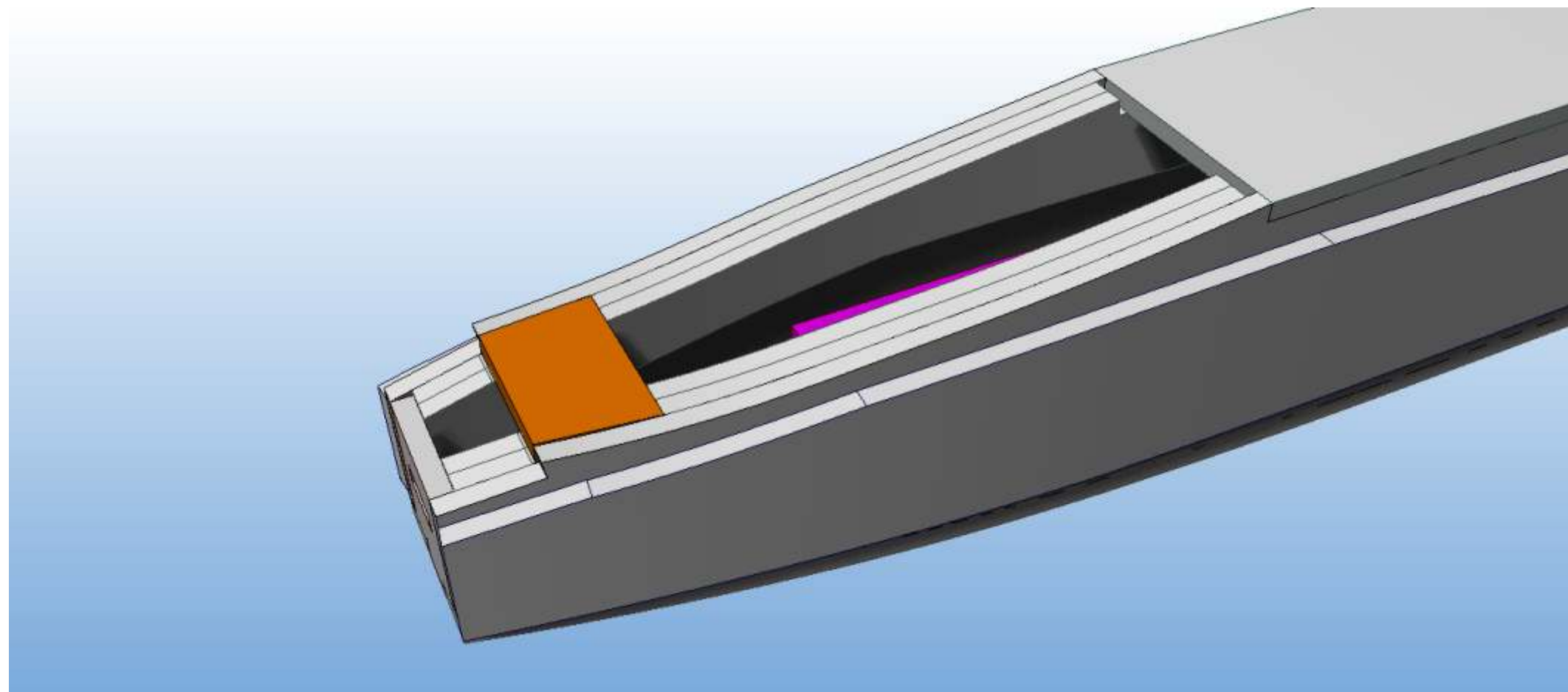
(Choose either single or double canopy version)





Glue the Fuselage Top (Inner) to the assembly.

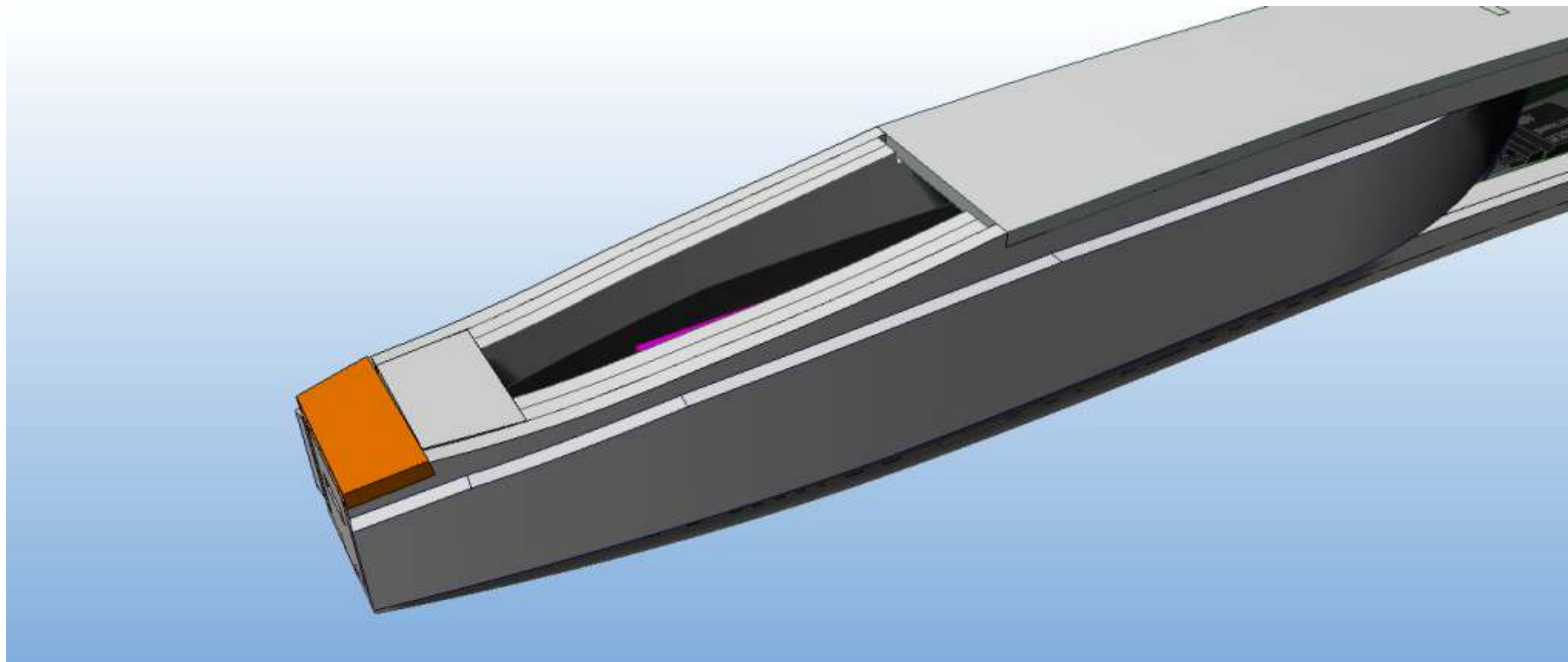
(Choose either single or double canopy version)



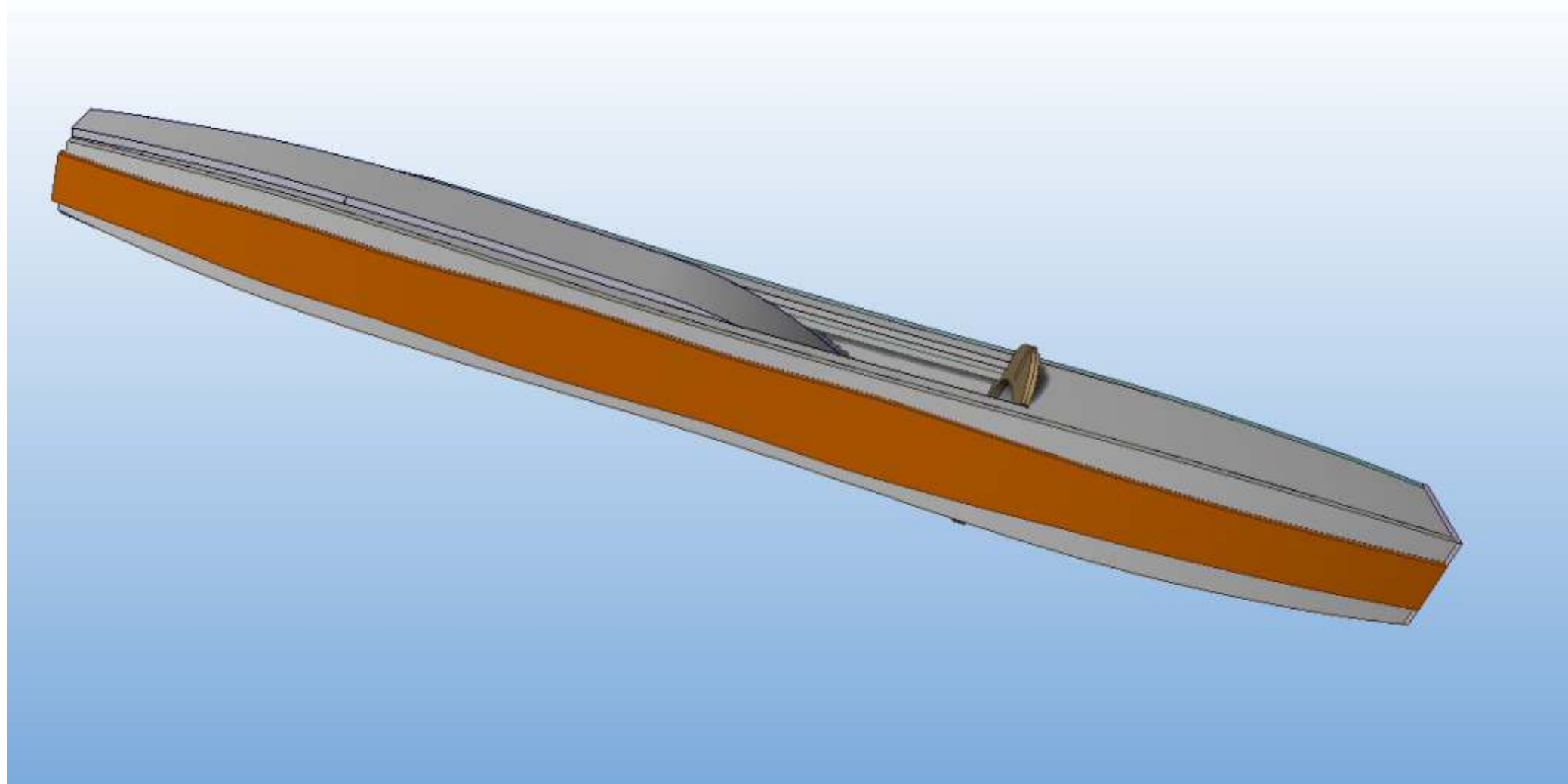
Glue the bridge panel in place.







Glue the Forward fuselage fuselage top (lower) in place.



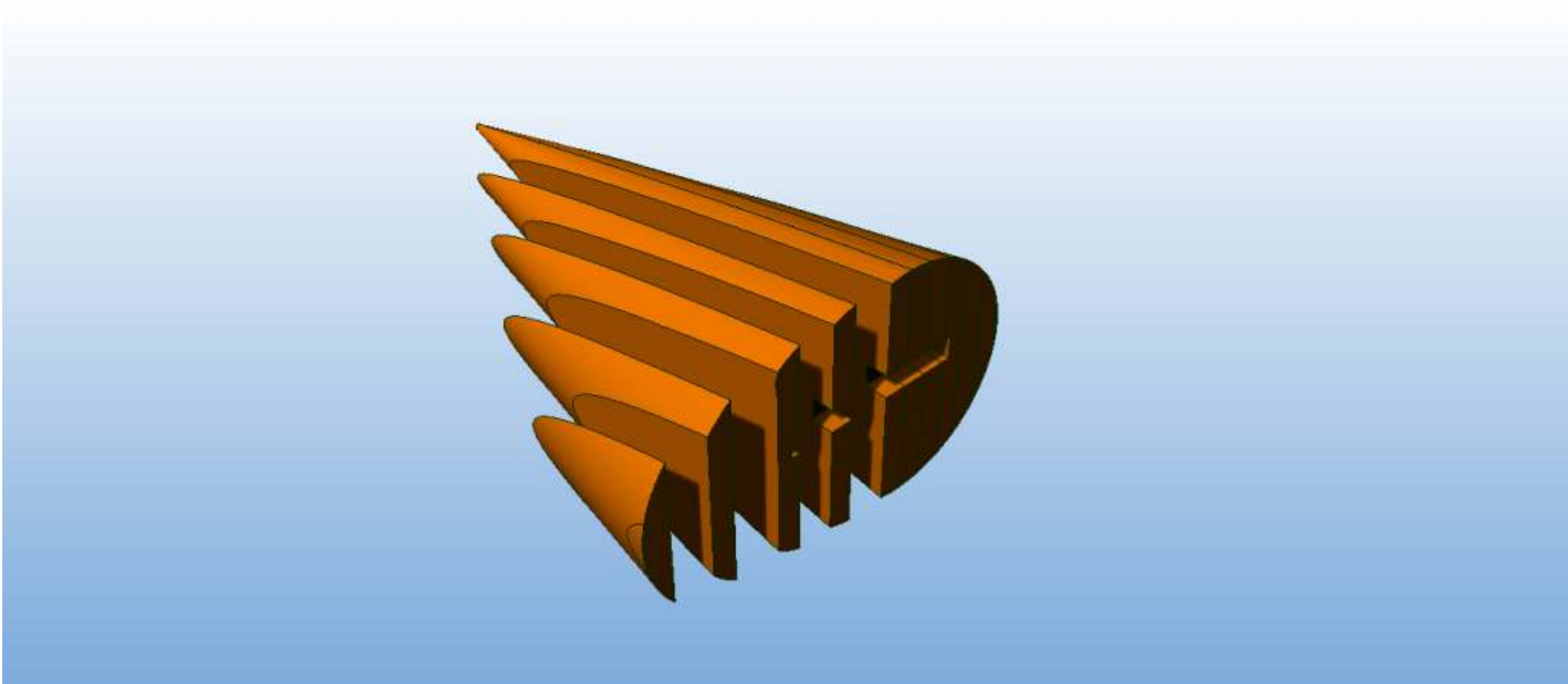
Using the centreline markings as a guide, glue the belly panel onto the fuselage.





Glue both the Forward fuselage top (upper) and the Fuselage top (upper) to the assembly as shown.

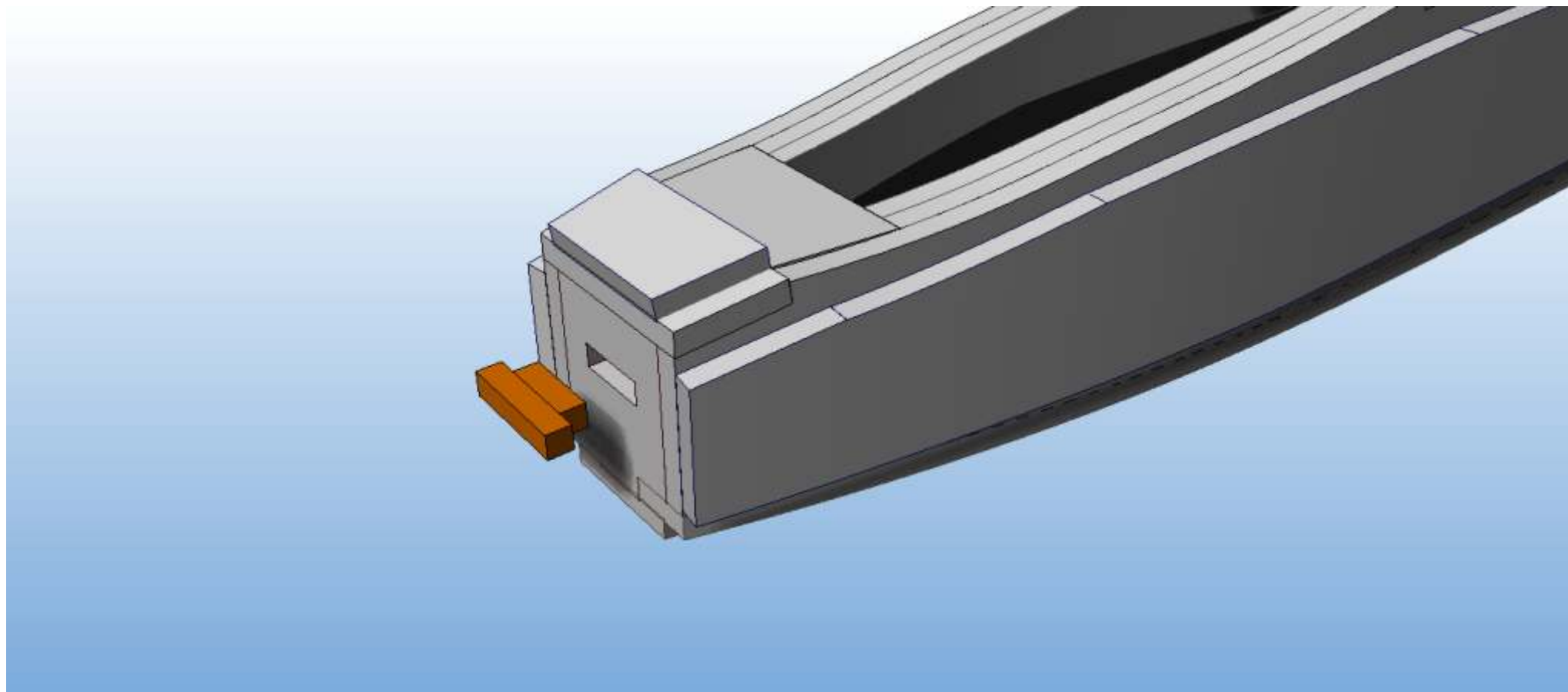
Choose whether you are having a single or double canopy.



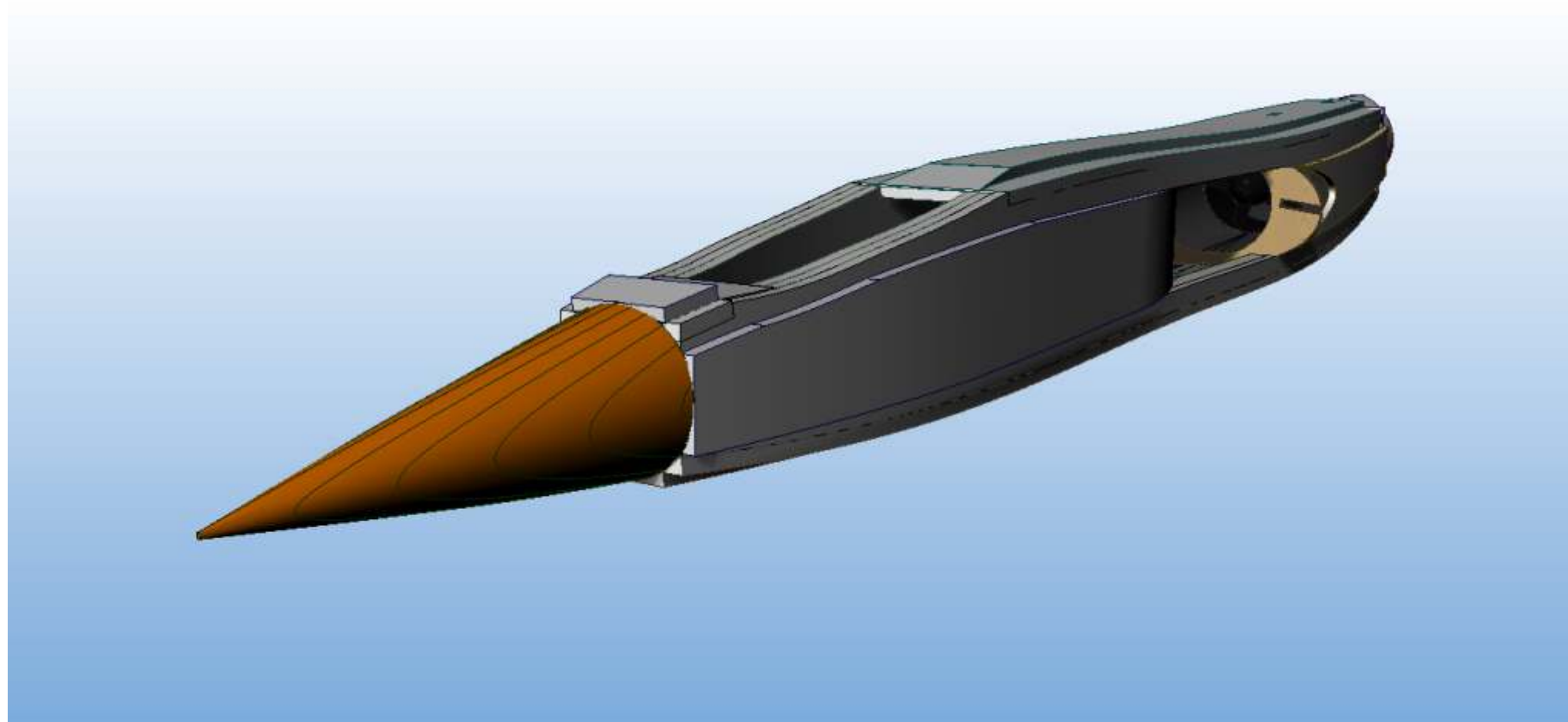
Glue together all the 10 pieces of the nosecone and sand to shape as shown.





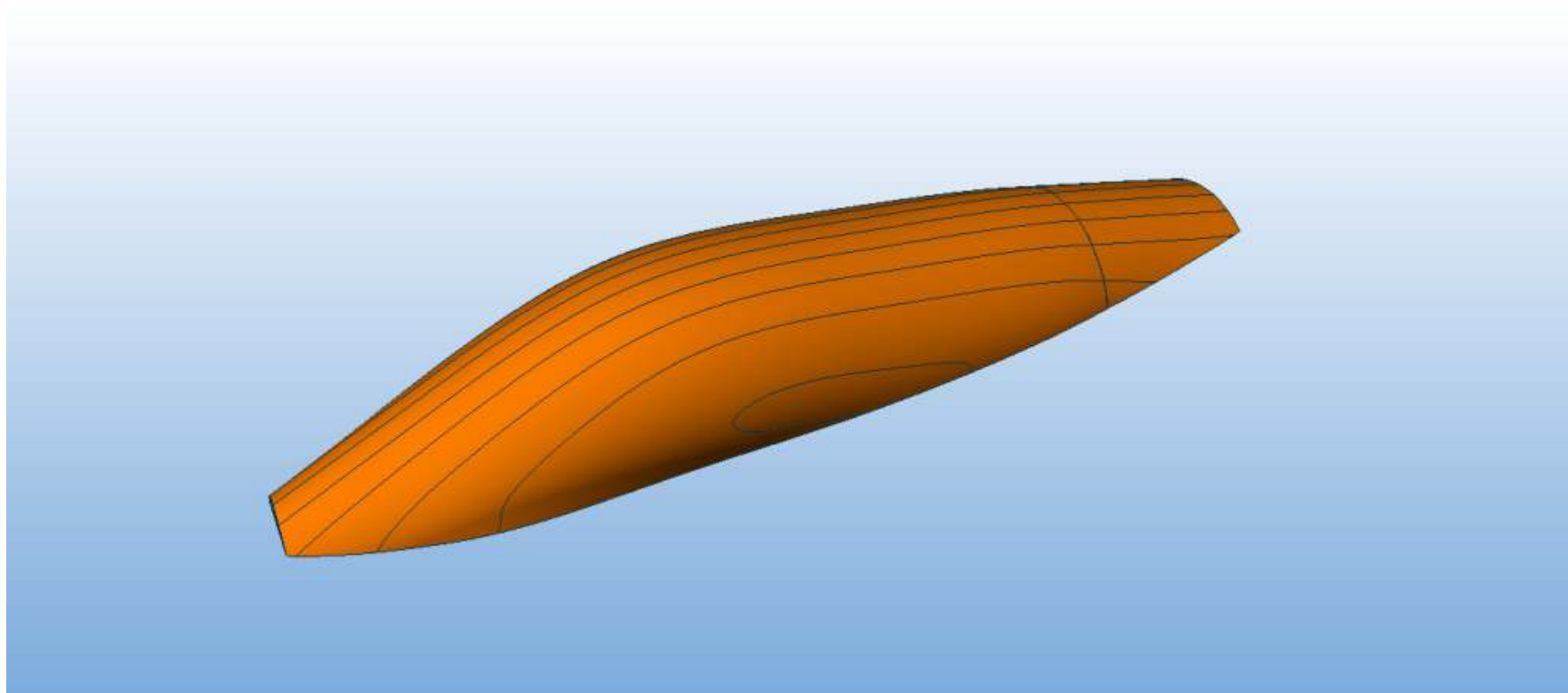


Glue the nosecone alignment jig in place as shown.

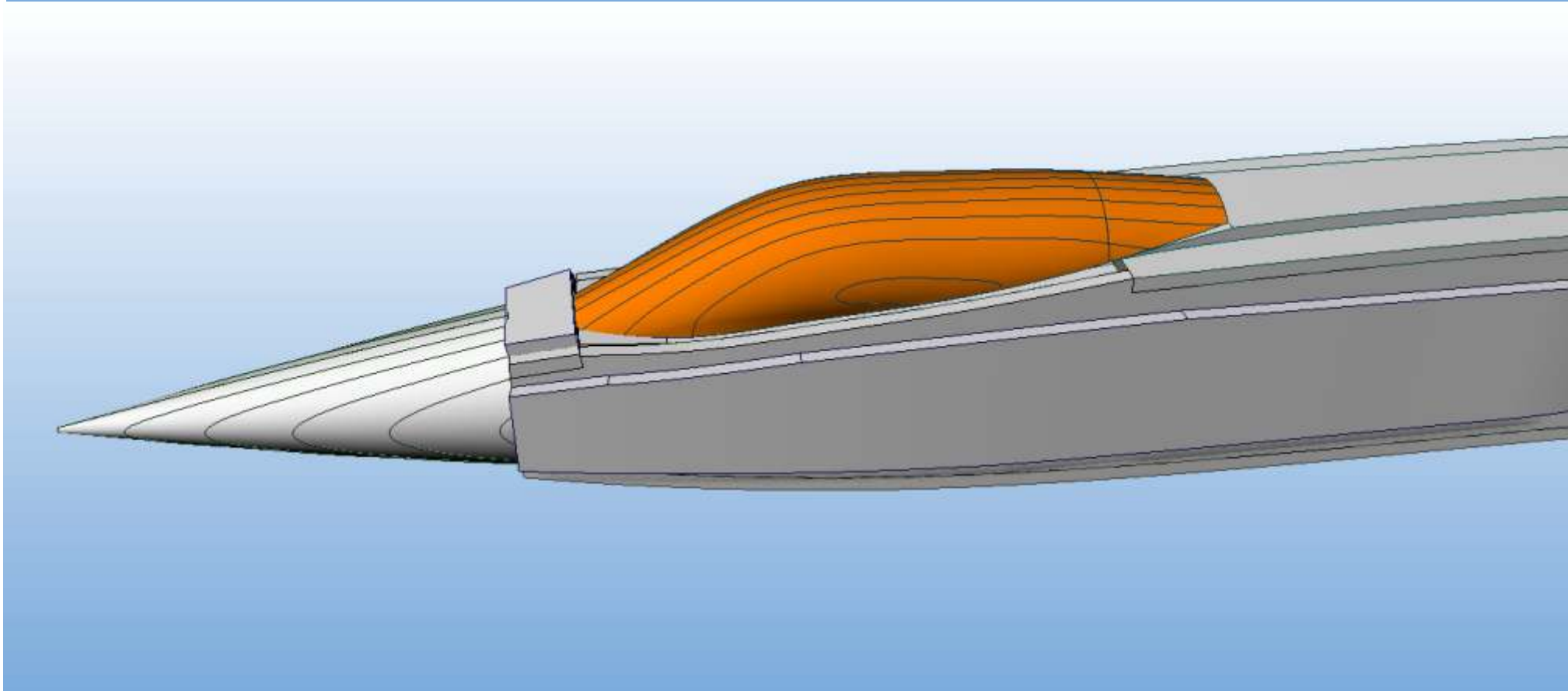


Glue the nosecone assembly onto the fuselage.





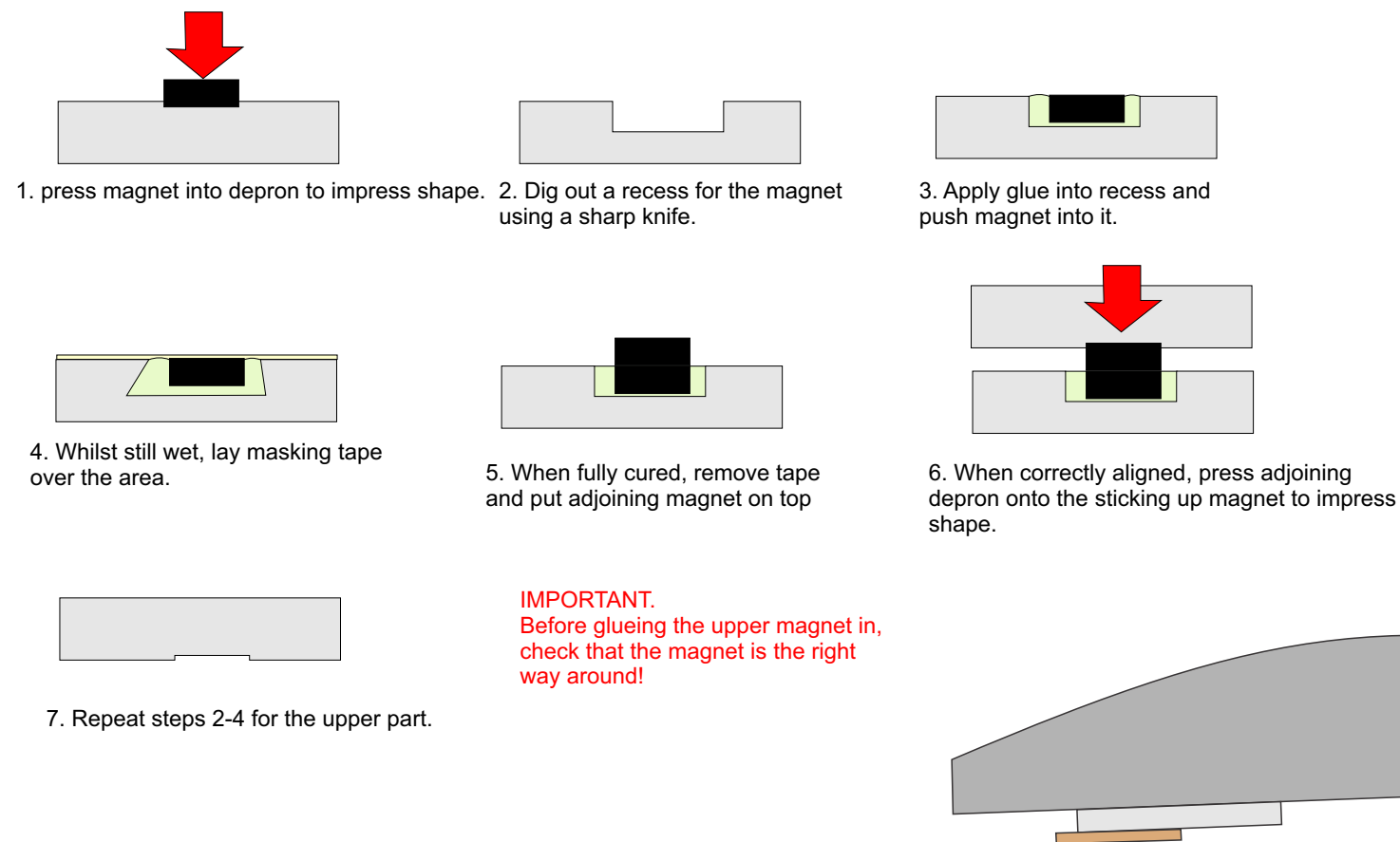
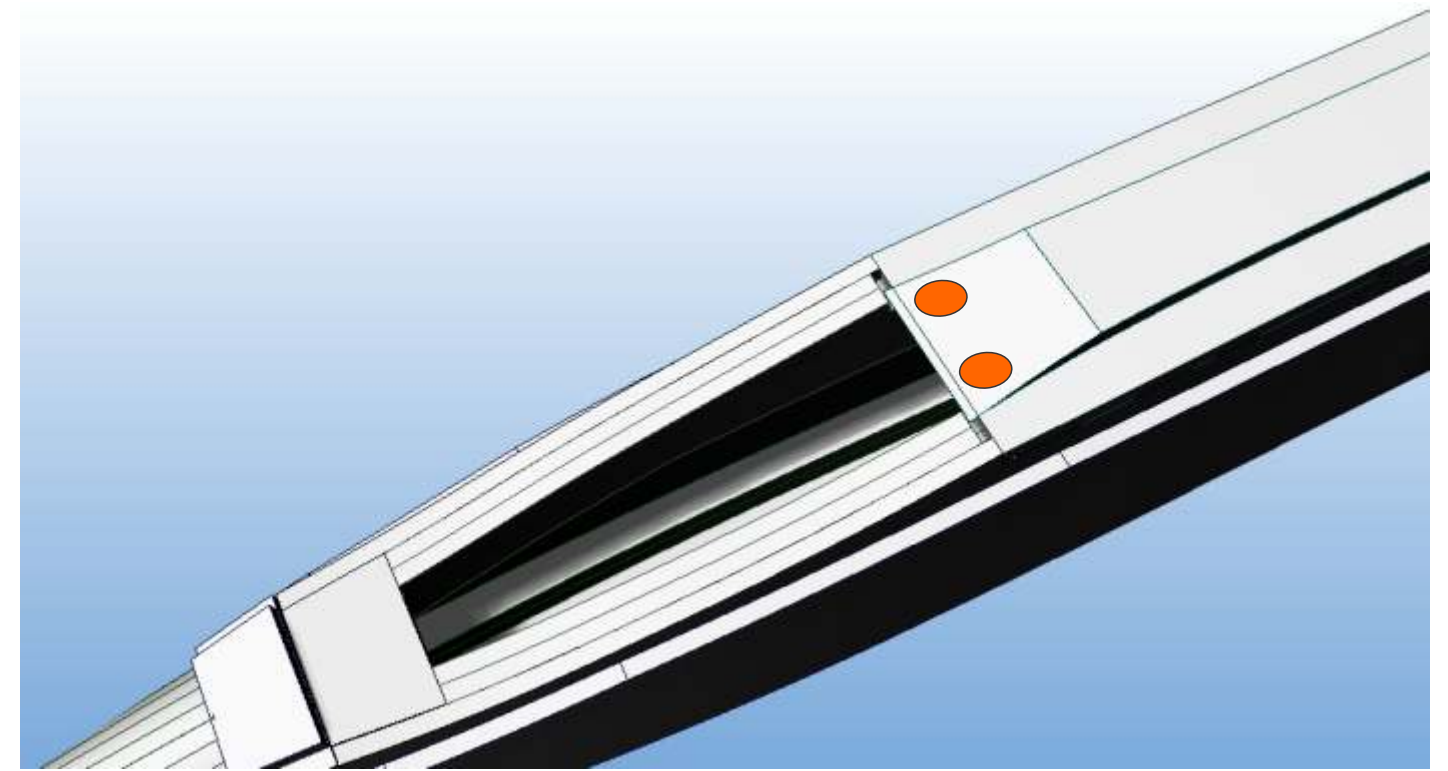
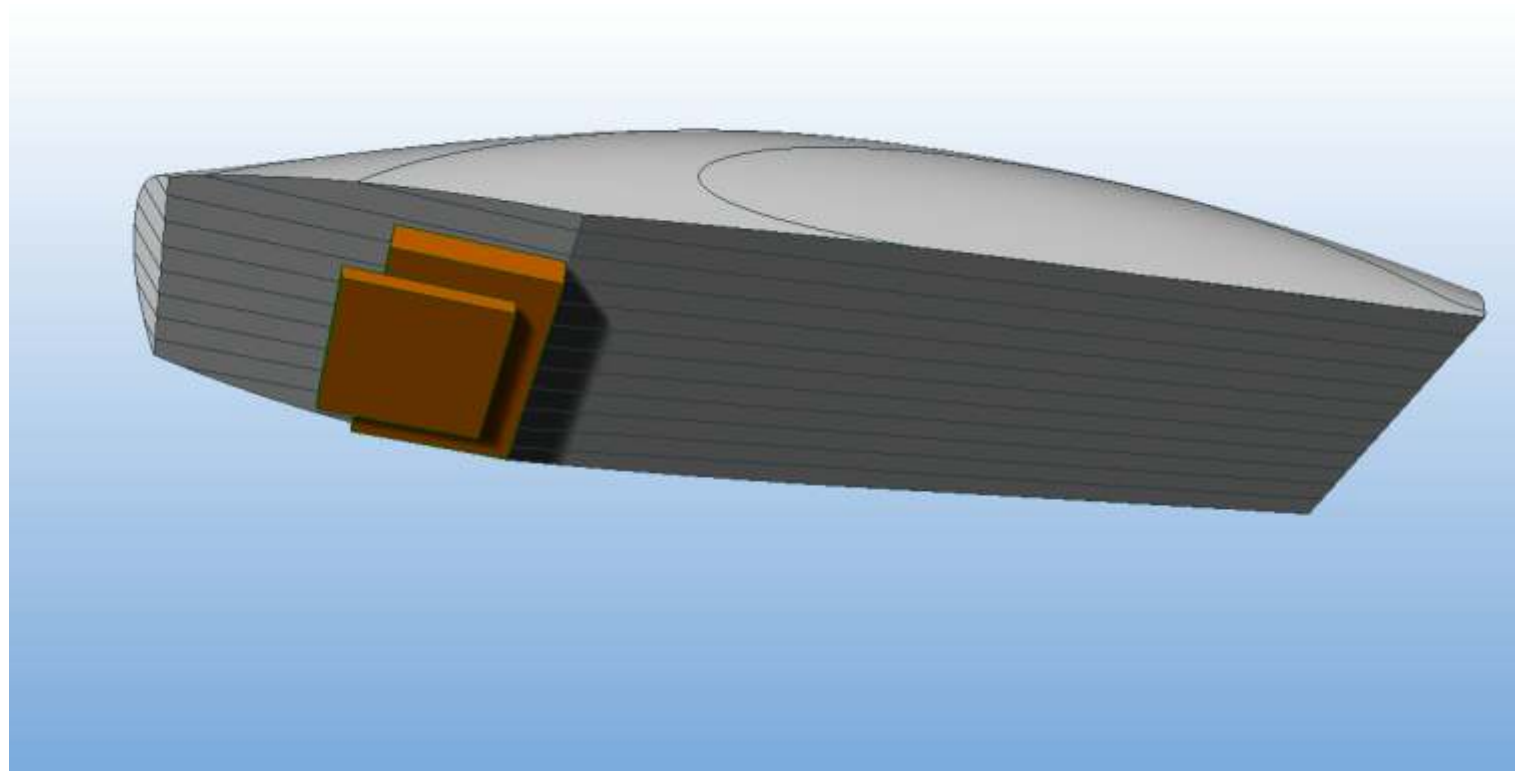
Choose which canopy you are fitting and then glue together the layers of depron and sand to shape.



Mark around the completed canopy with a pencil onto the fuselage to mark the edge position.





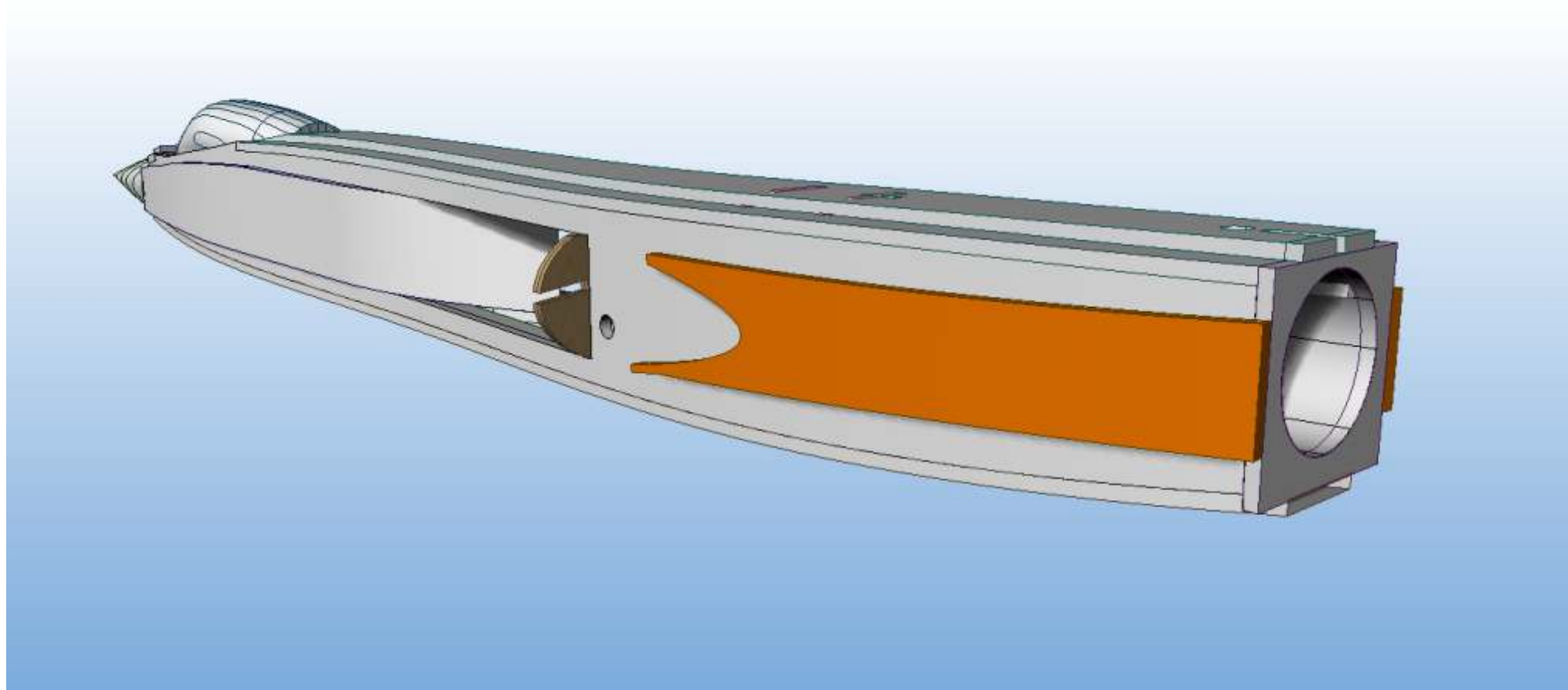


Build a tongue using a piece of scrap depron and 3mm liteply at the front of the canopy.

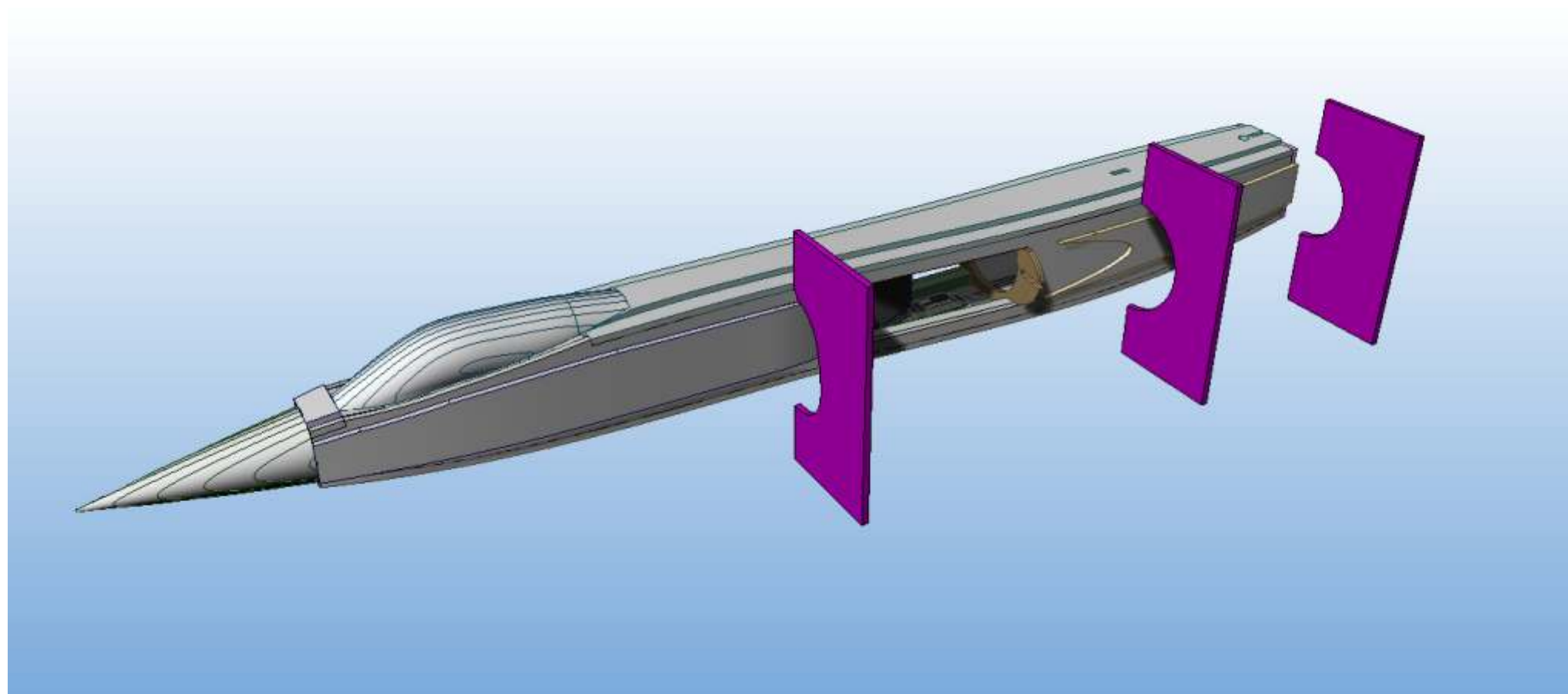
Attach the magnets to the magnet panel (or as per image above if you are building the twin cockpit version)

Epoxy the magnets to rear of the canopy so that the canopy is removable but holds firmly in place when mounted.





Using the dotted line on the plans to guide you, glue the rear fuselage sides in place as shown.

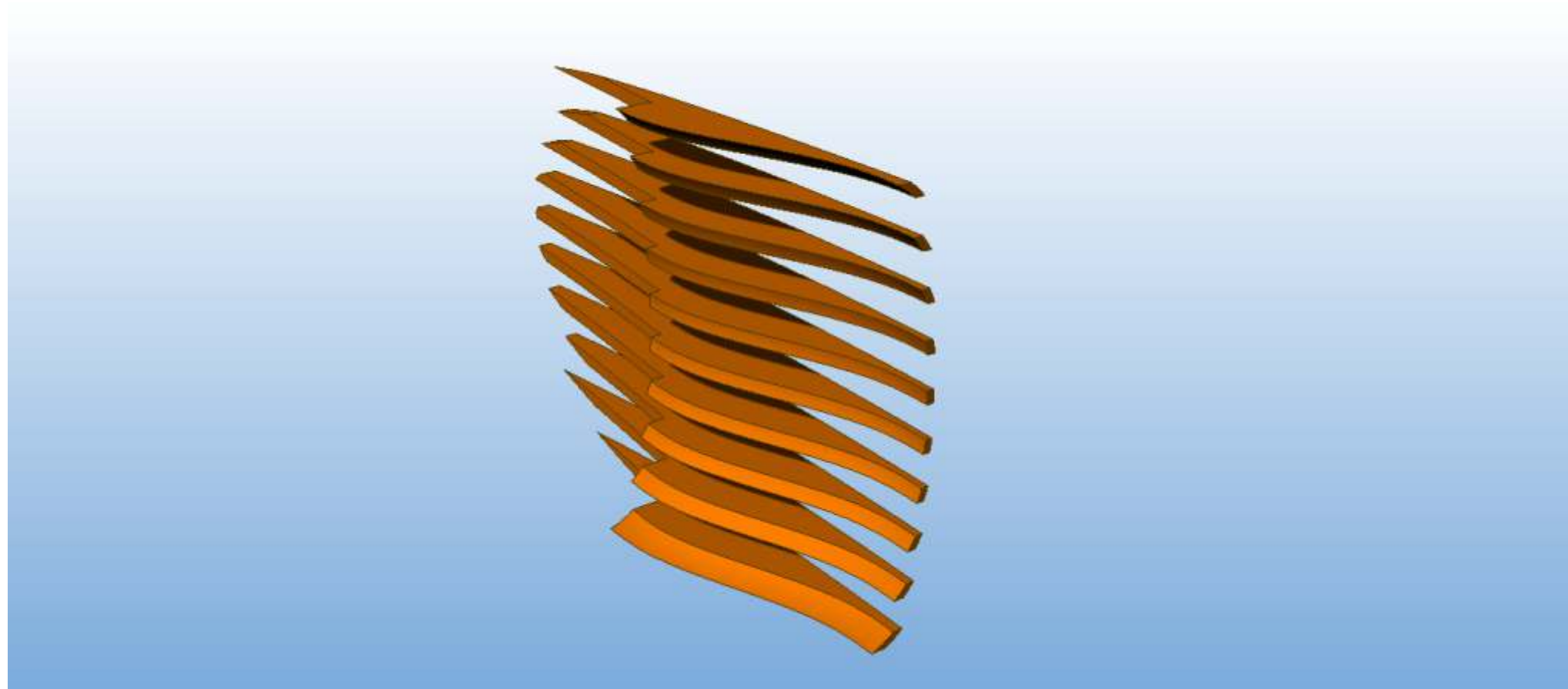


Using the jigs as a template shape the fuselage to shape using the following steps :-

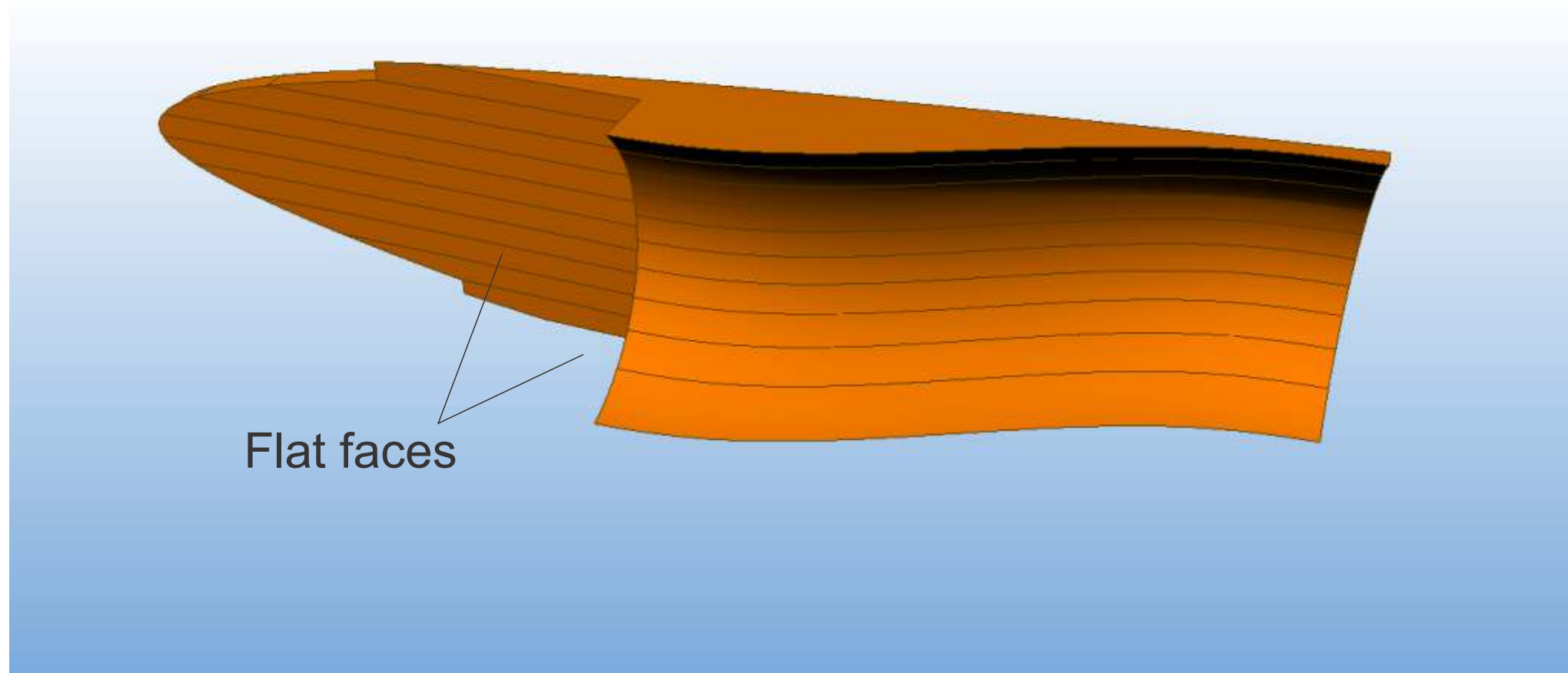
1. Roughly - Retractable Knife.
2. Shaping - Mini Electric sander.
3. Smoothing - Sandpaper and Block.





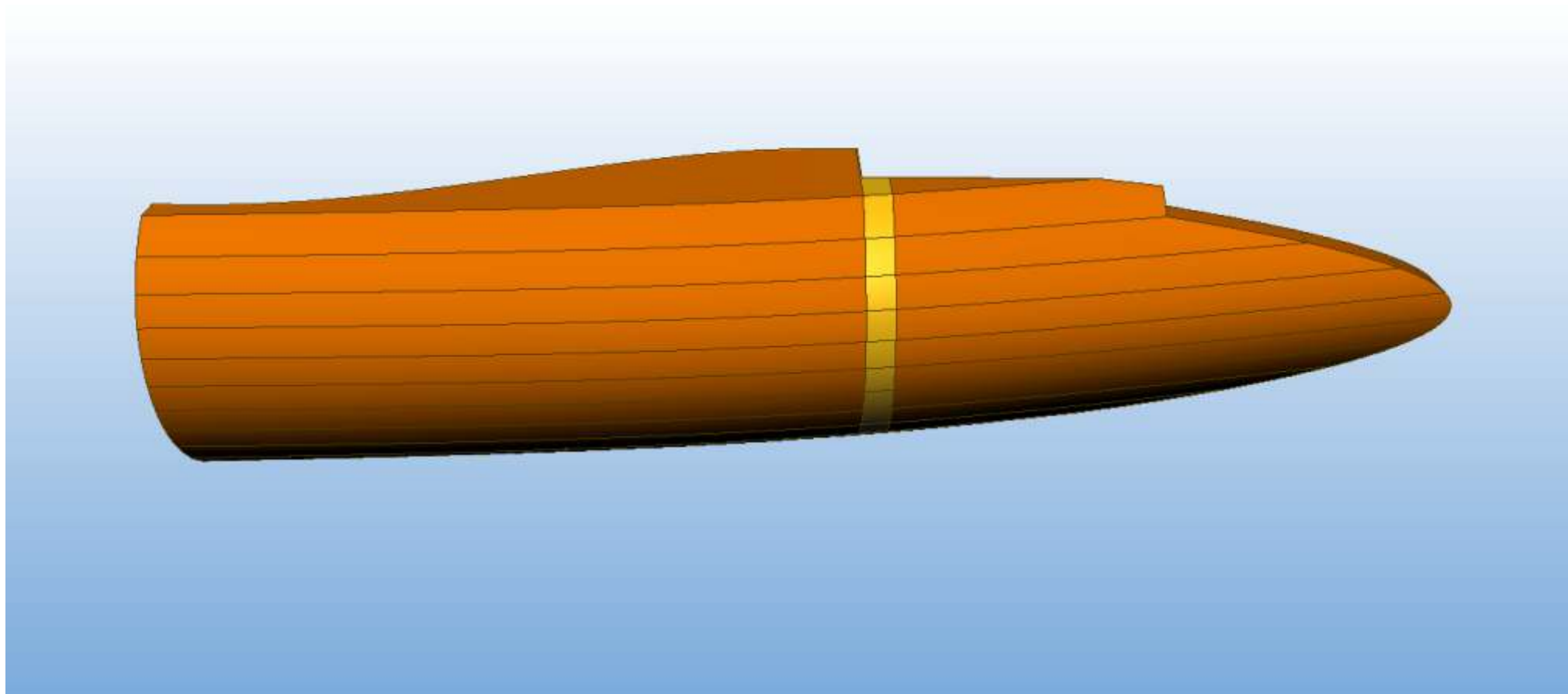


Carefully prepare each piece of the 10 air intake pieces. Glue together using the flat faces / corner to ensure accurate alignment. (flat faces identified on next step below)

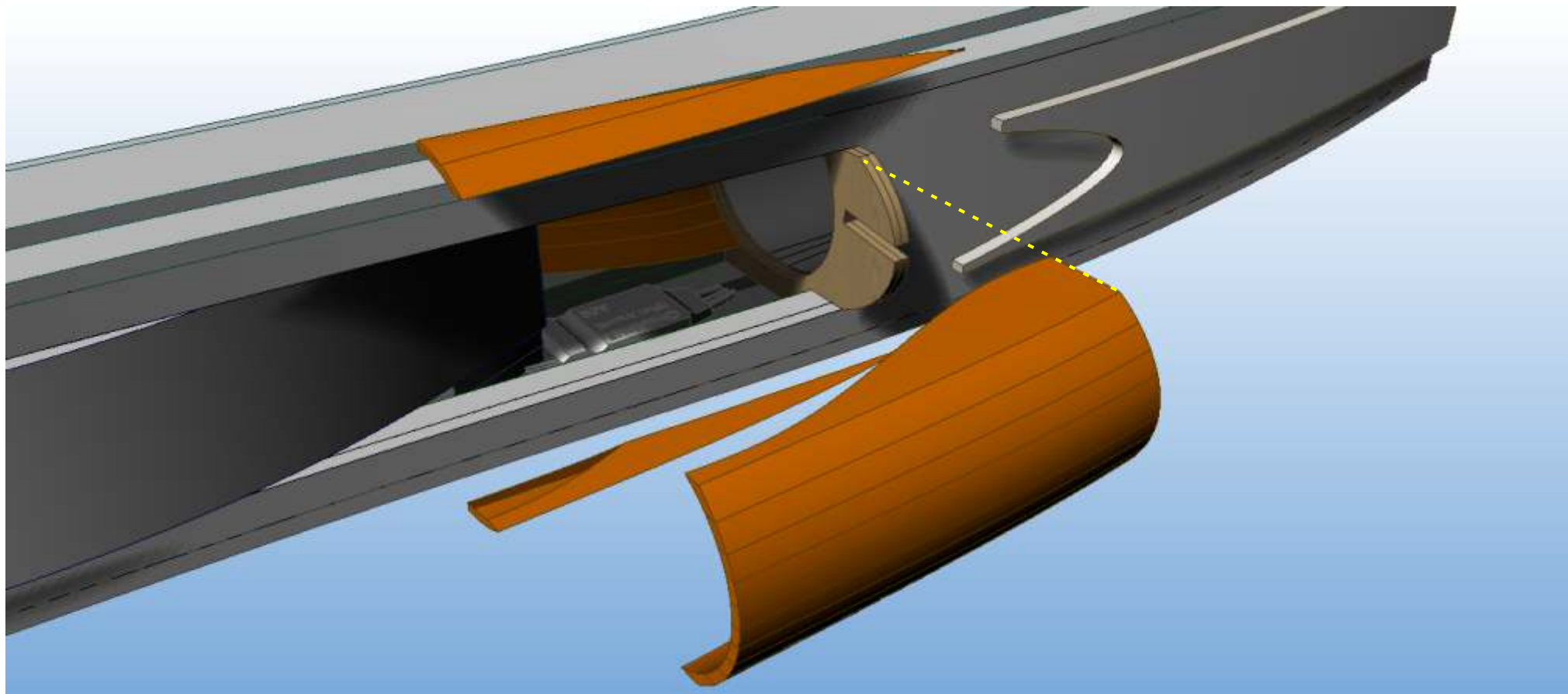


Sand the curvaceous shapes using sandpaper and block / sandpaper and fingers being very careful not to damage the edges wherever possible.





Carefully slice a 6mm piece out of the intake block as shown.

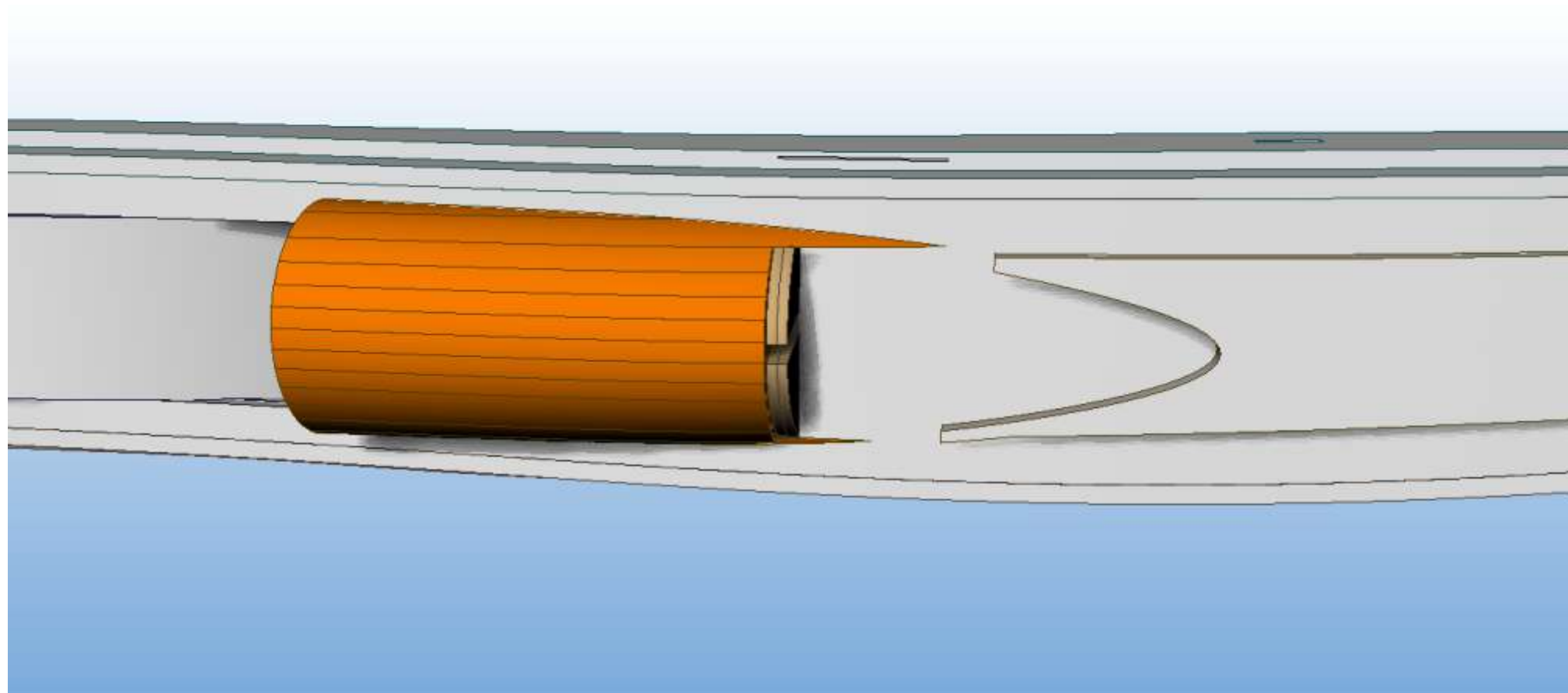


Prepare the upper and lower air intake pieces and glue to the main block. These will help position the front edge of the intake correctly.

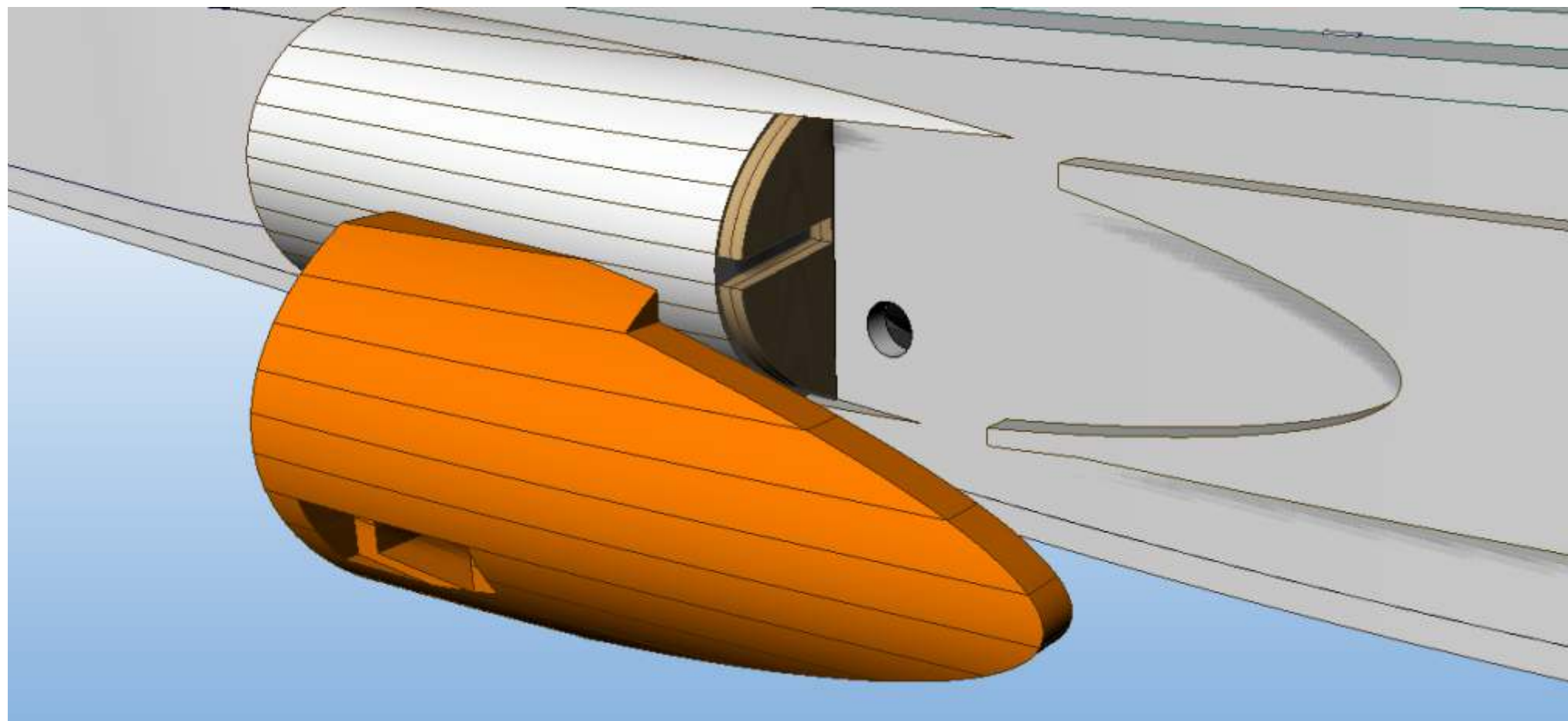
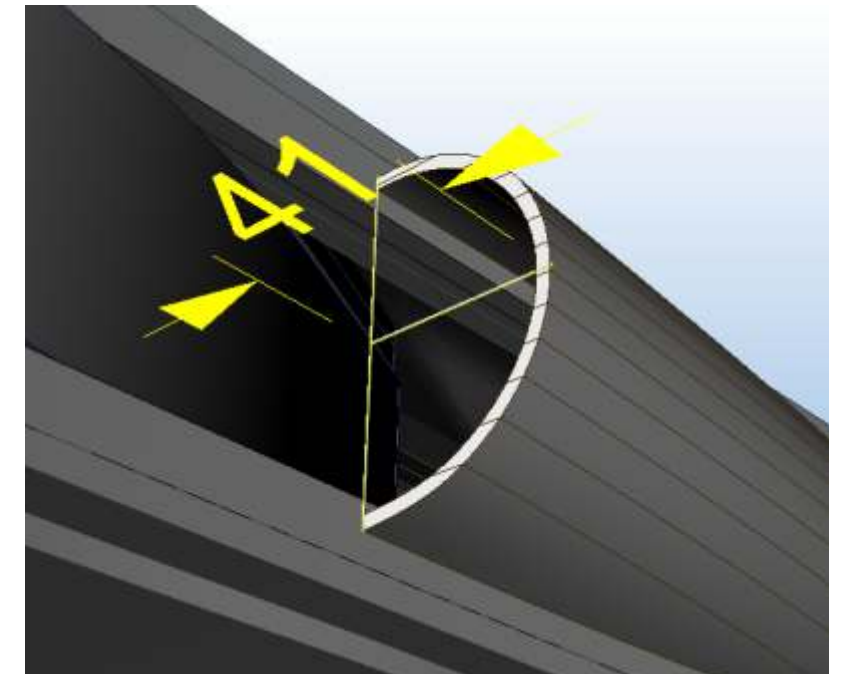
Glue the entire block to the side of the fuselage using UHU Por, and to the Structural bulkhead using Epoxy.





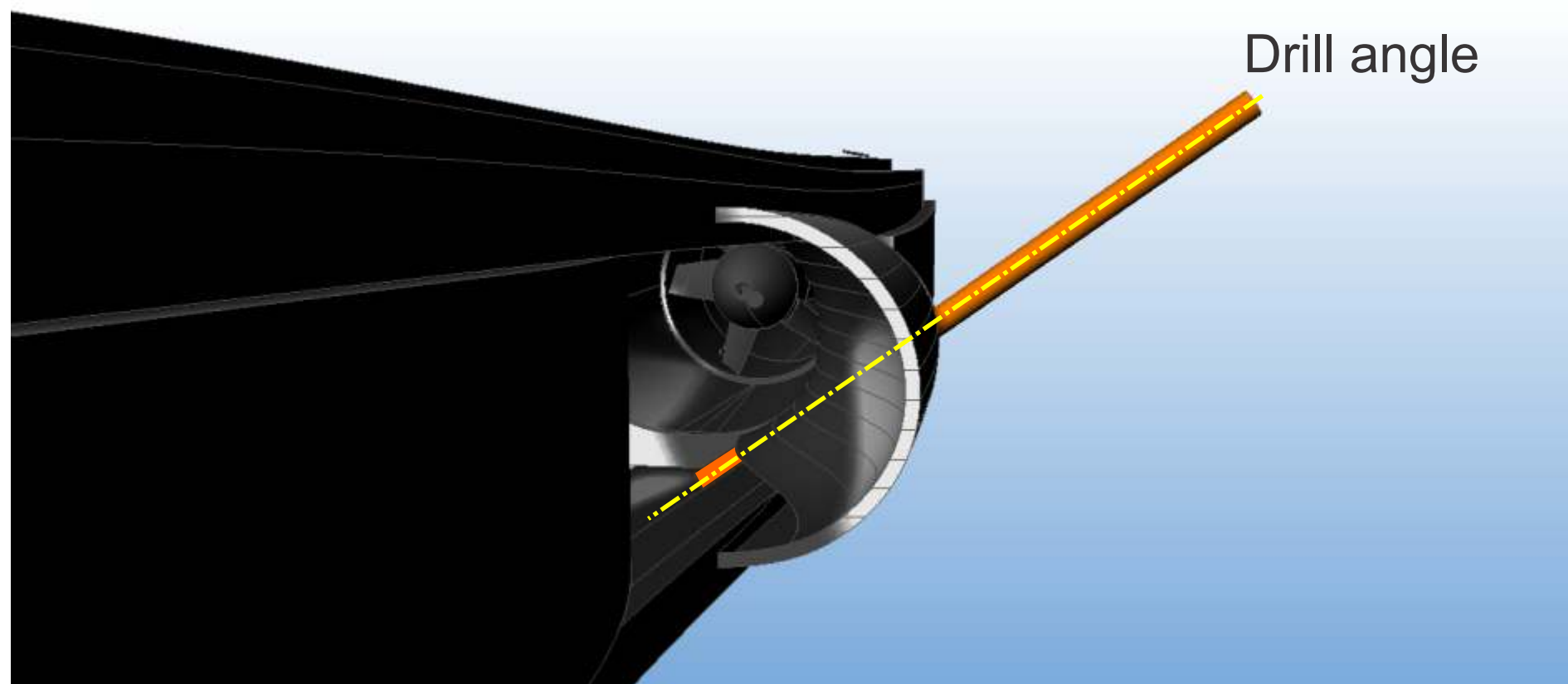


When correctly aligned and assembled - it should look like this.



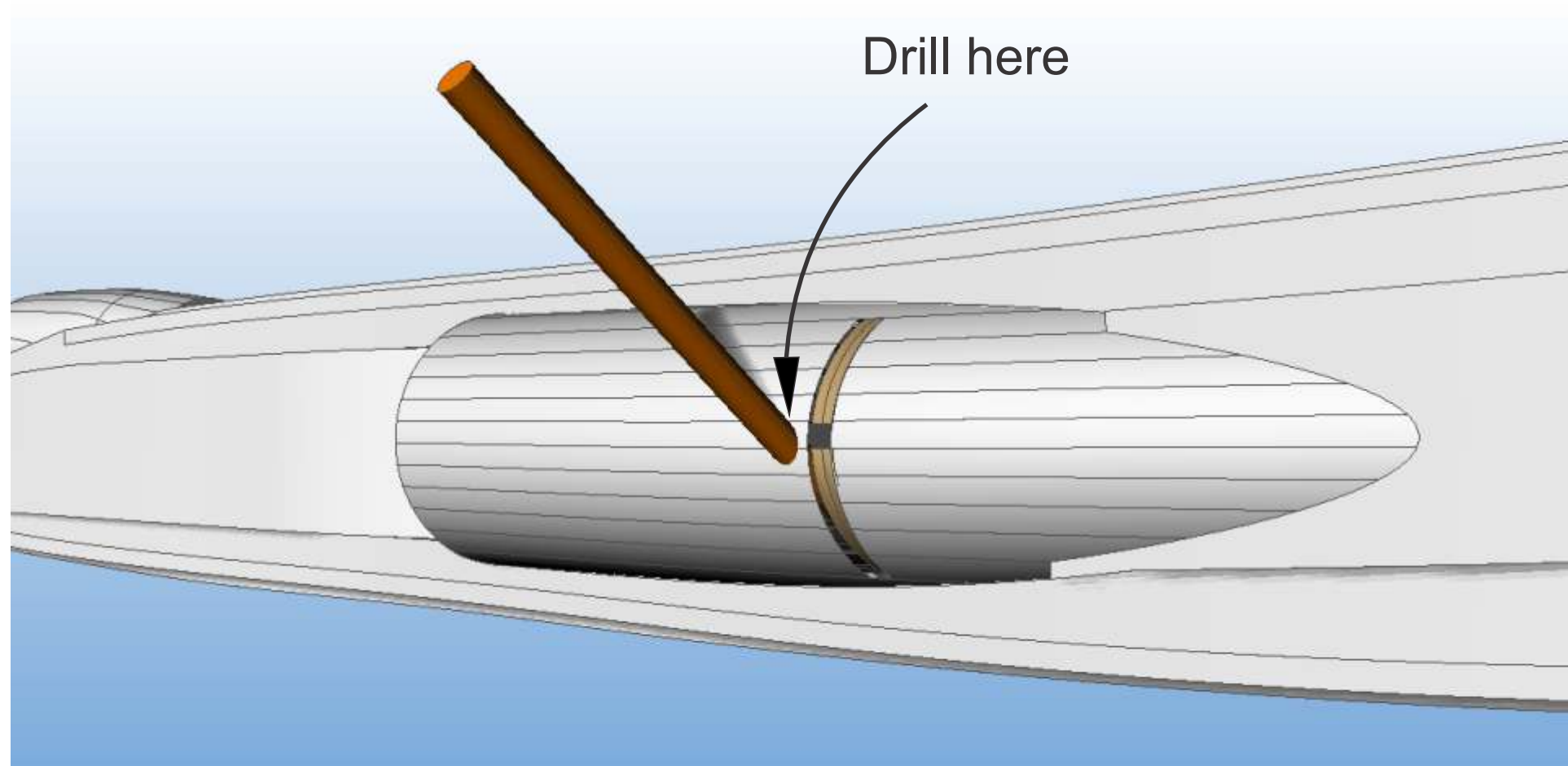
Trim out the hole for the wing servo, thread the servo wire through and then glue in place as shown..



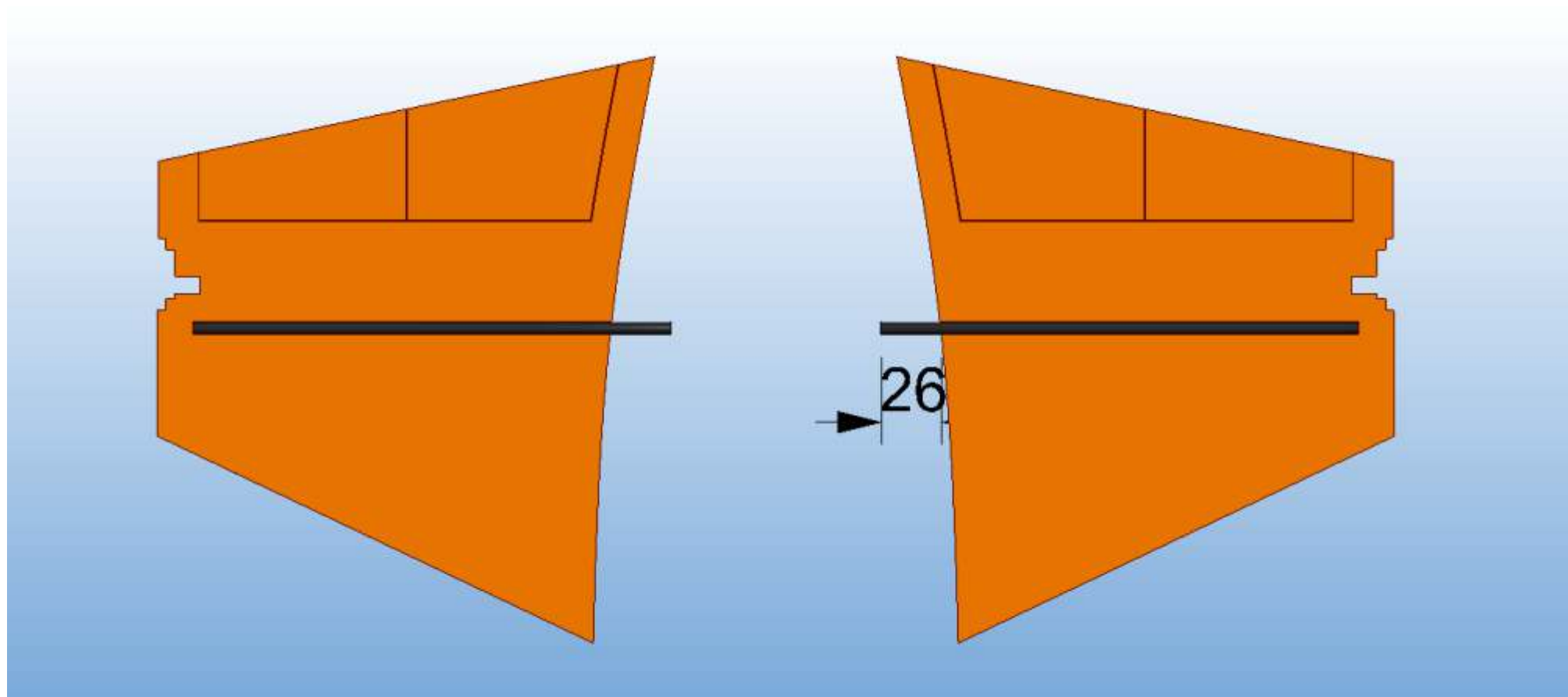


If you are running servos out to the wing tanks then you will need to drill a passageway for the servo lead to travel through.

Carefully drill on this angle from the point indicated near to the carbon rod slot.







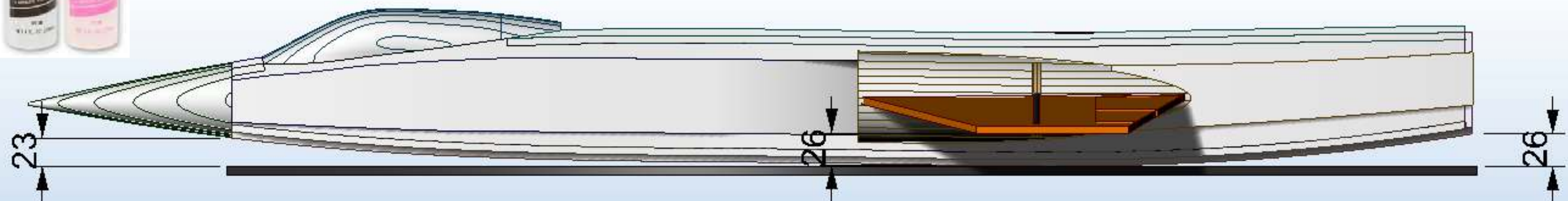
Glue the carbon rods into the wings as shown leaving 26mm protruding.

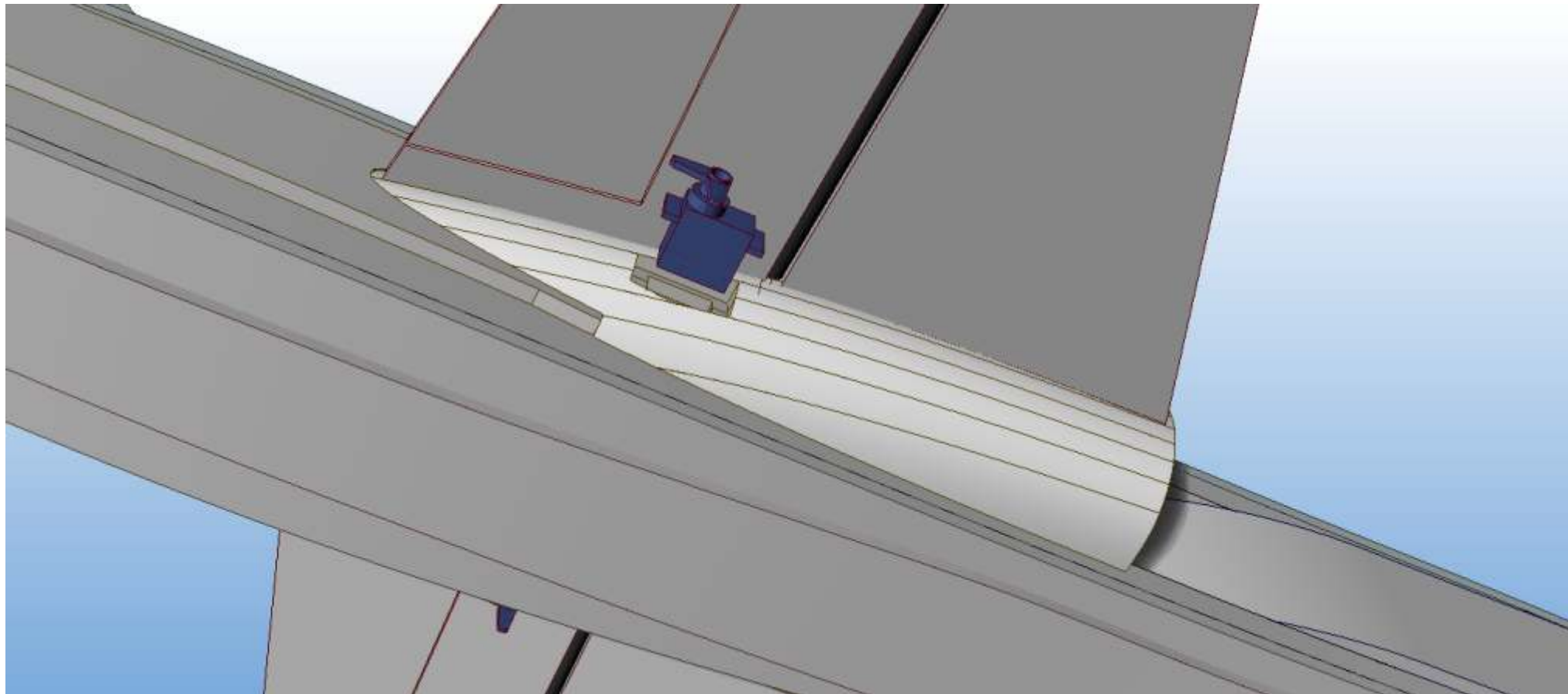
Use masking tape either way to retain the epoxy while it sets.

Test fit the wings to ensure a snug fit.

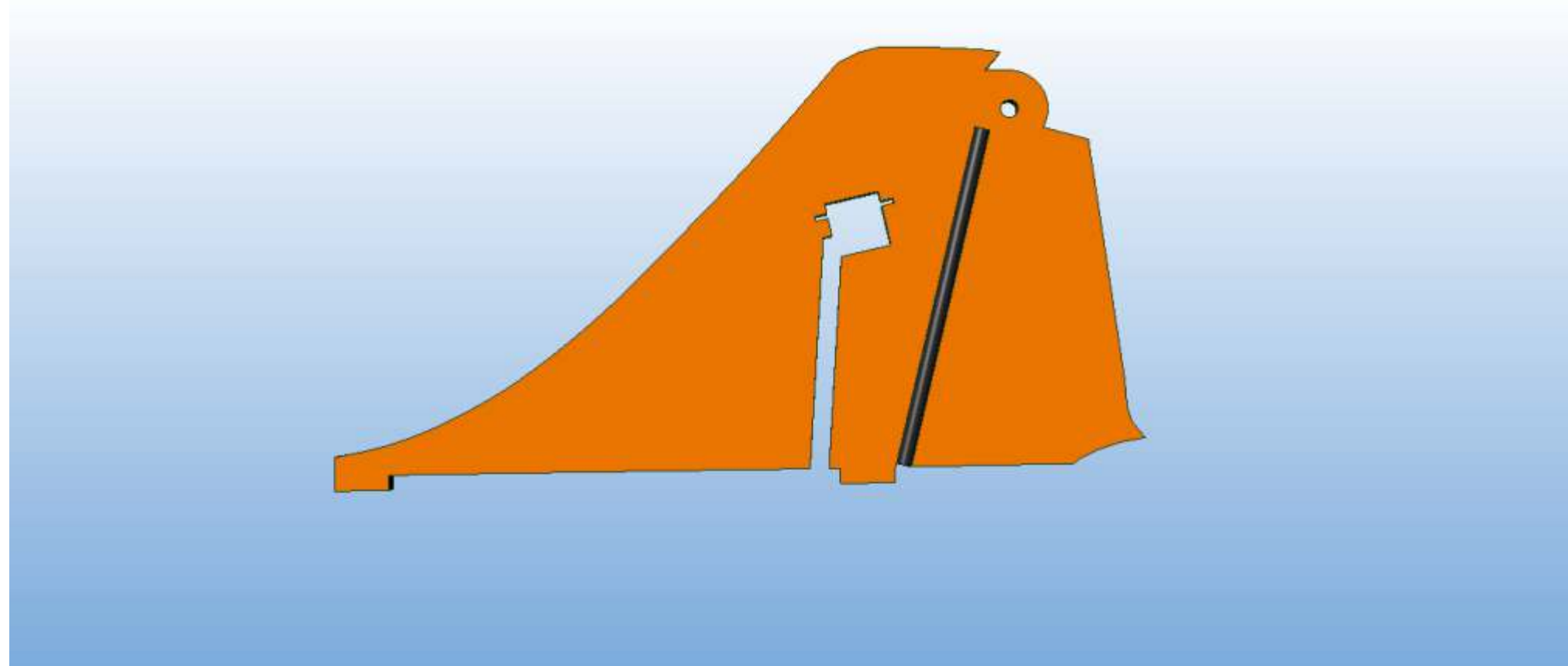
Prepare scrap pieces of depron to hold the fuselage at the correct angle as shown in the image below.

Use books / depron to the depth of 26mm etc on a flat surface to support the wingtips. Glue the wings to the fuselage using epoxy.





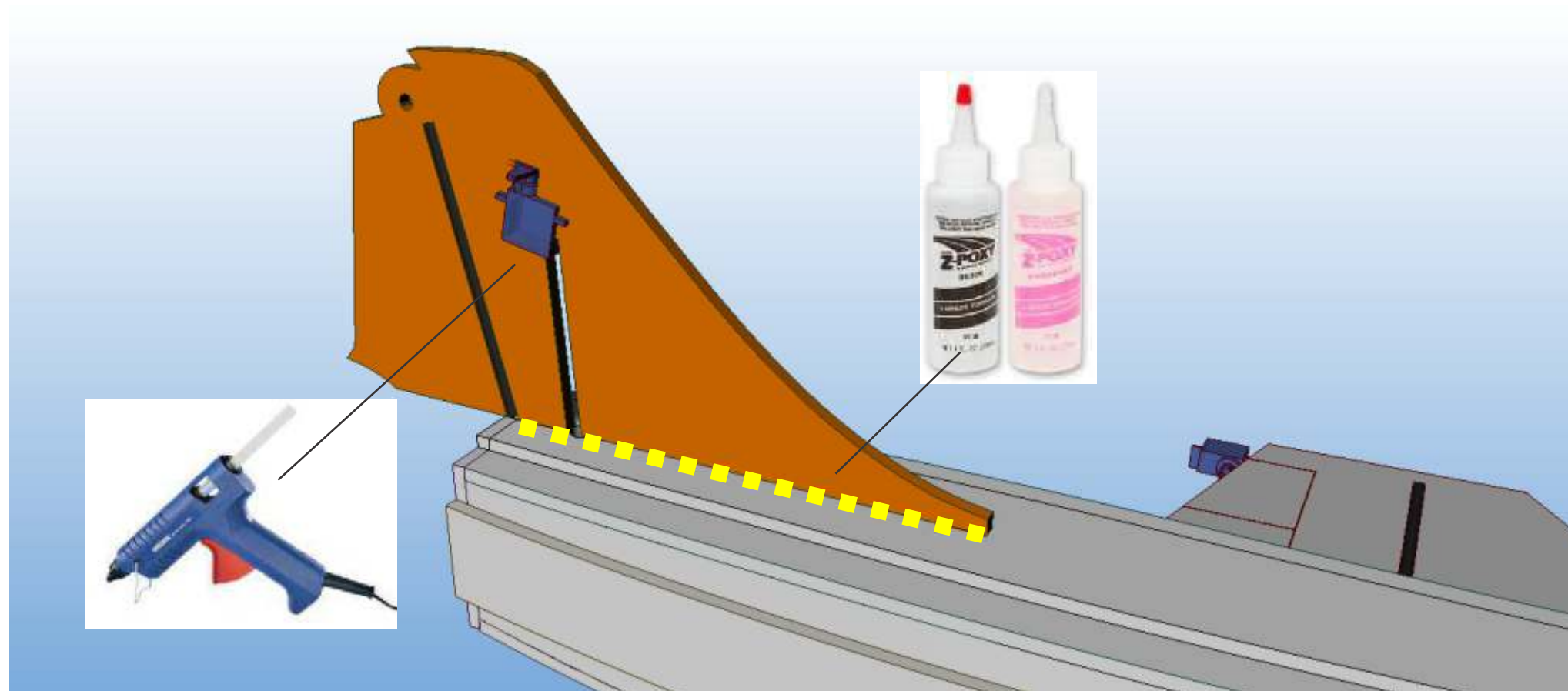
Glue the fuselage servos into place using hot melt glue.



Glue the carbon spar into the 6mm vertical stabiliser as shown using masking tape on both sides while the glue sets.



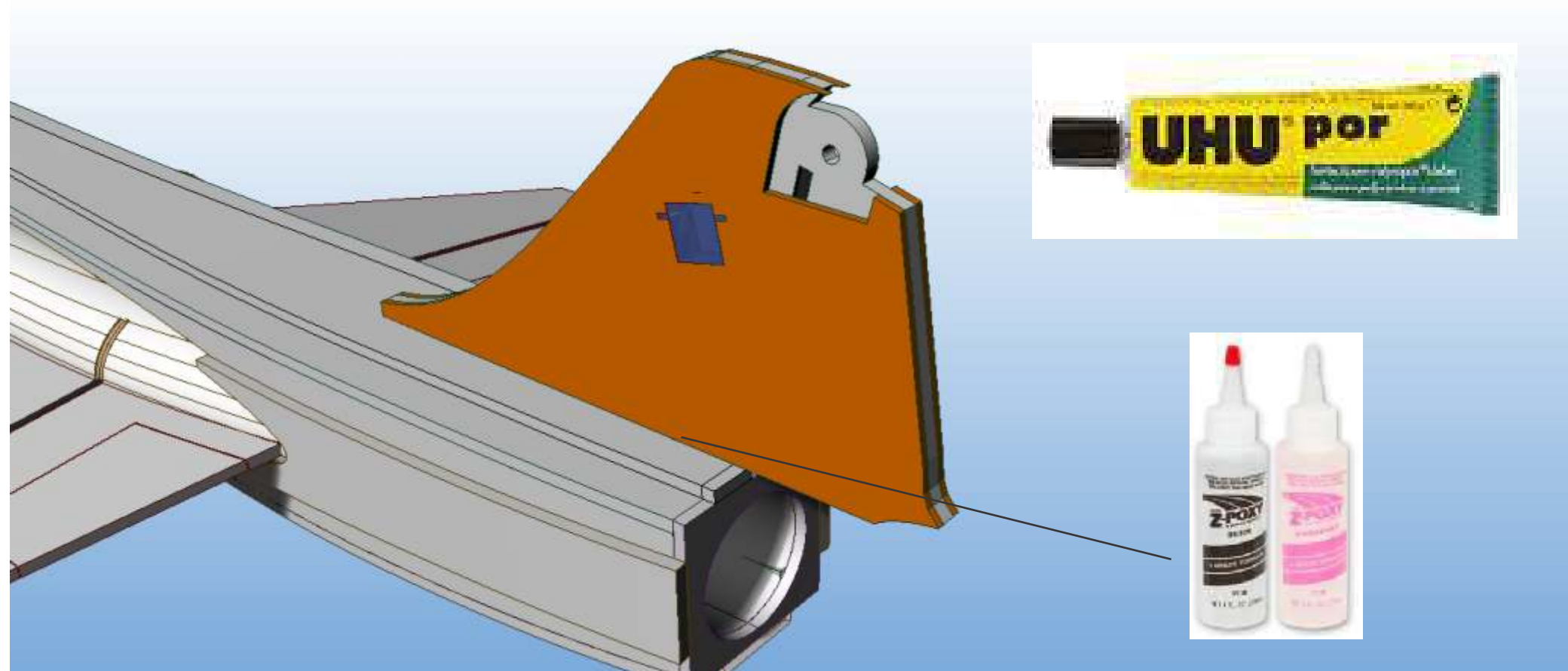




### CHOOSE :-

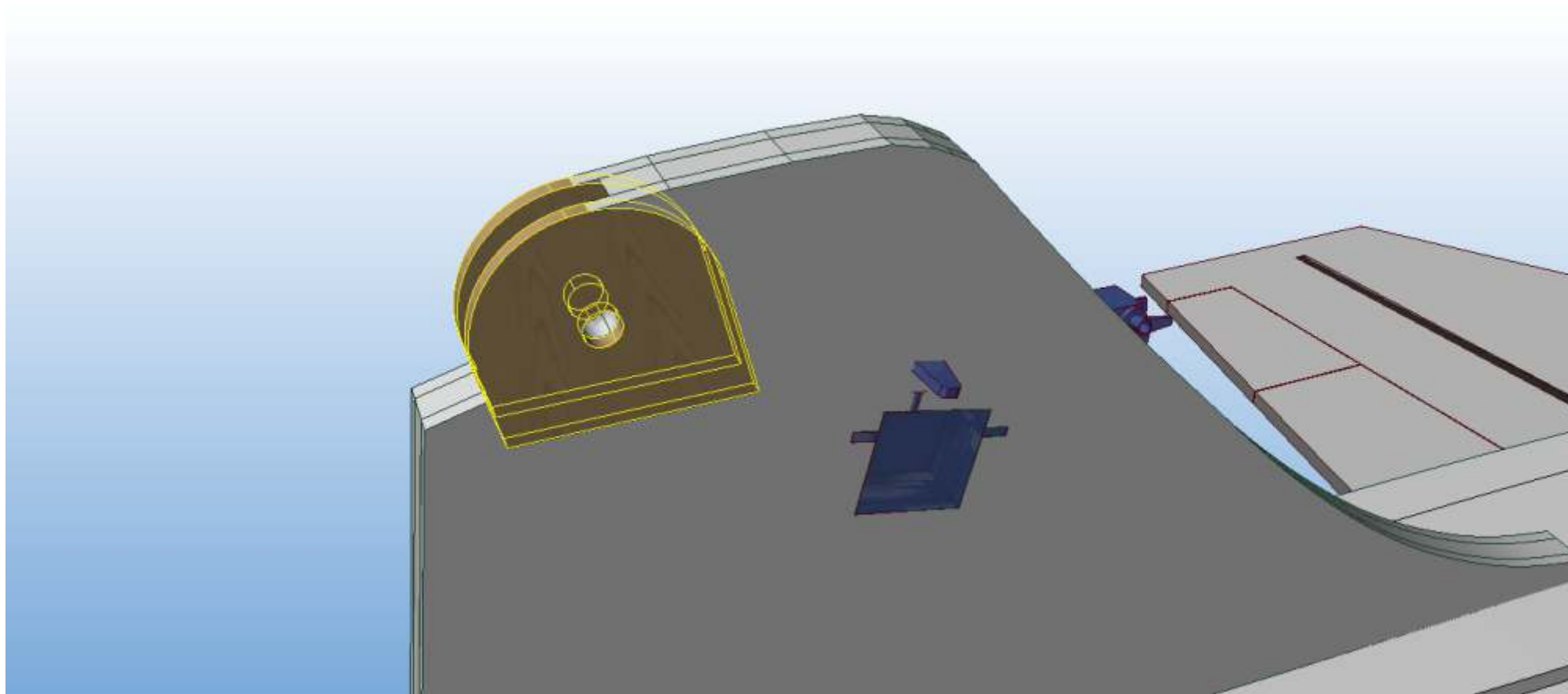
Select your preferred vertical stabiliser type then Glue the horizontal stabiliser servo in place as shown with hot melt glue- connecting the servo to the servo extension lead.

Glue the vertical stabiliser in place using epoxy to the fuselage

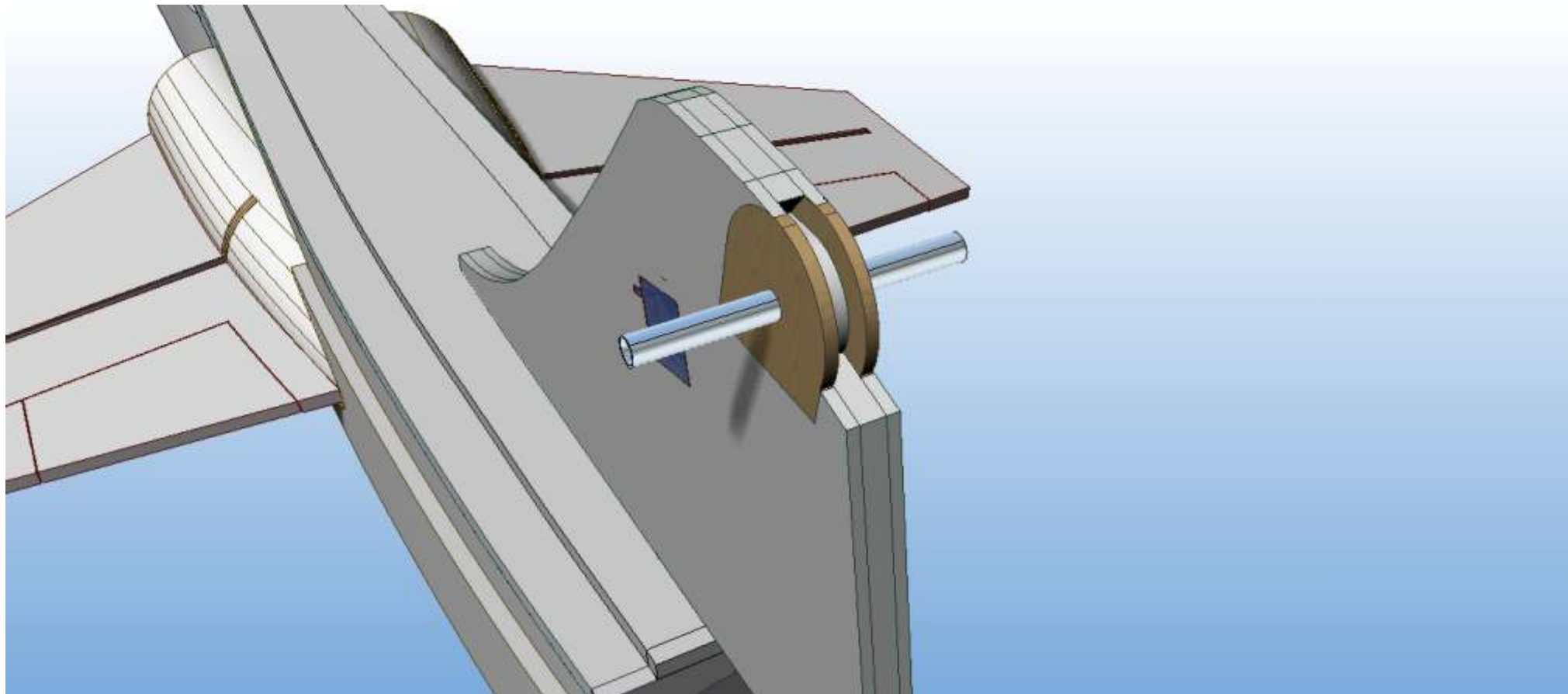


Glue the two 3mm vertical stabiliser side pieces to the 6mm central piece. Use epoxy at the base to ensure a good bond.





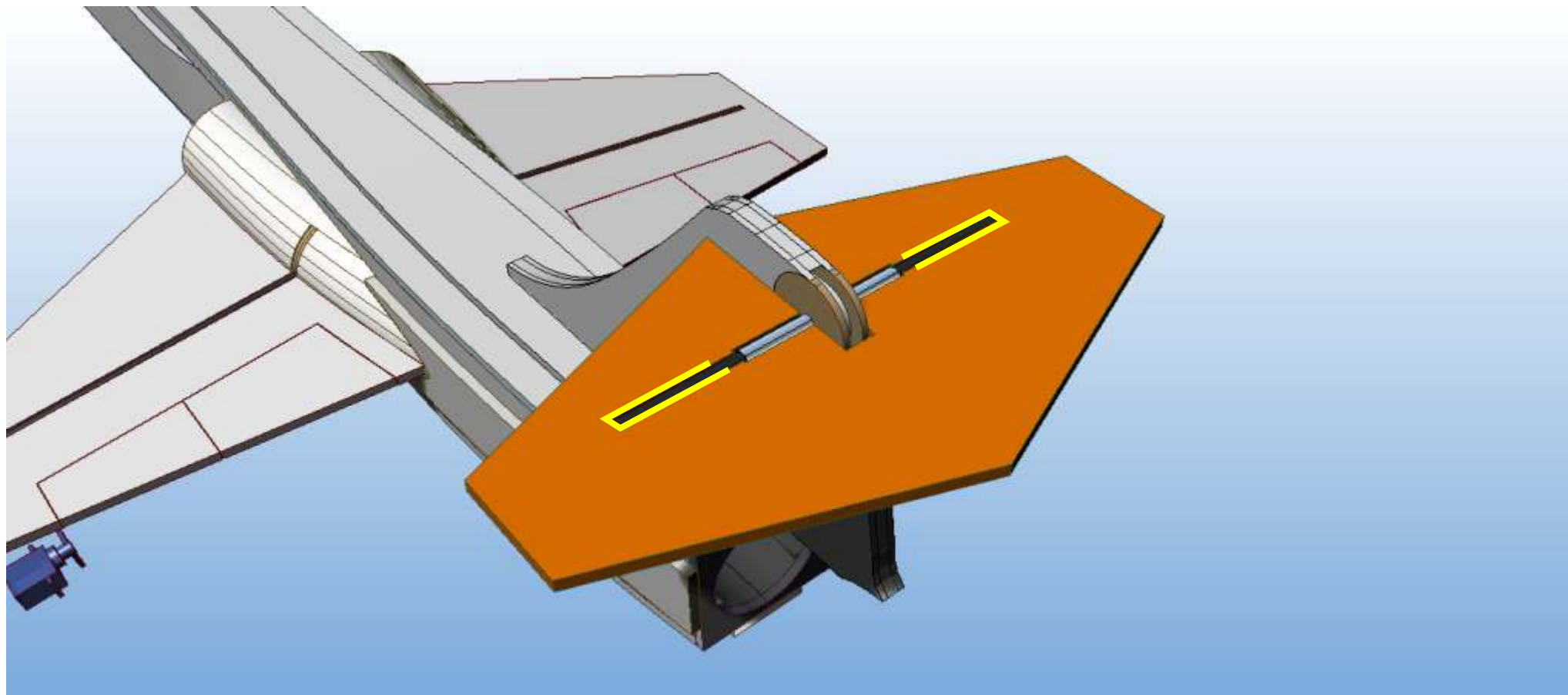
Glue the 3mm Lite Ply Horizontal stabiliser braces in place as shown.



Carefully align the 80mm aluminium tube at 90degrees to the Vertical stabiliser as shown and glue it solidly in place.

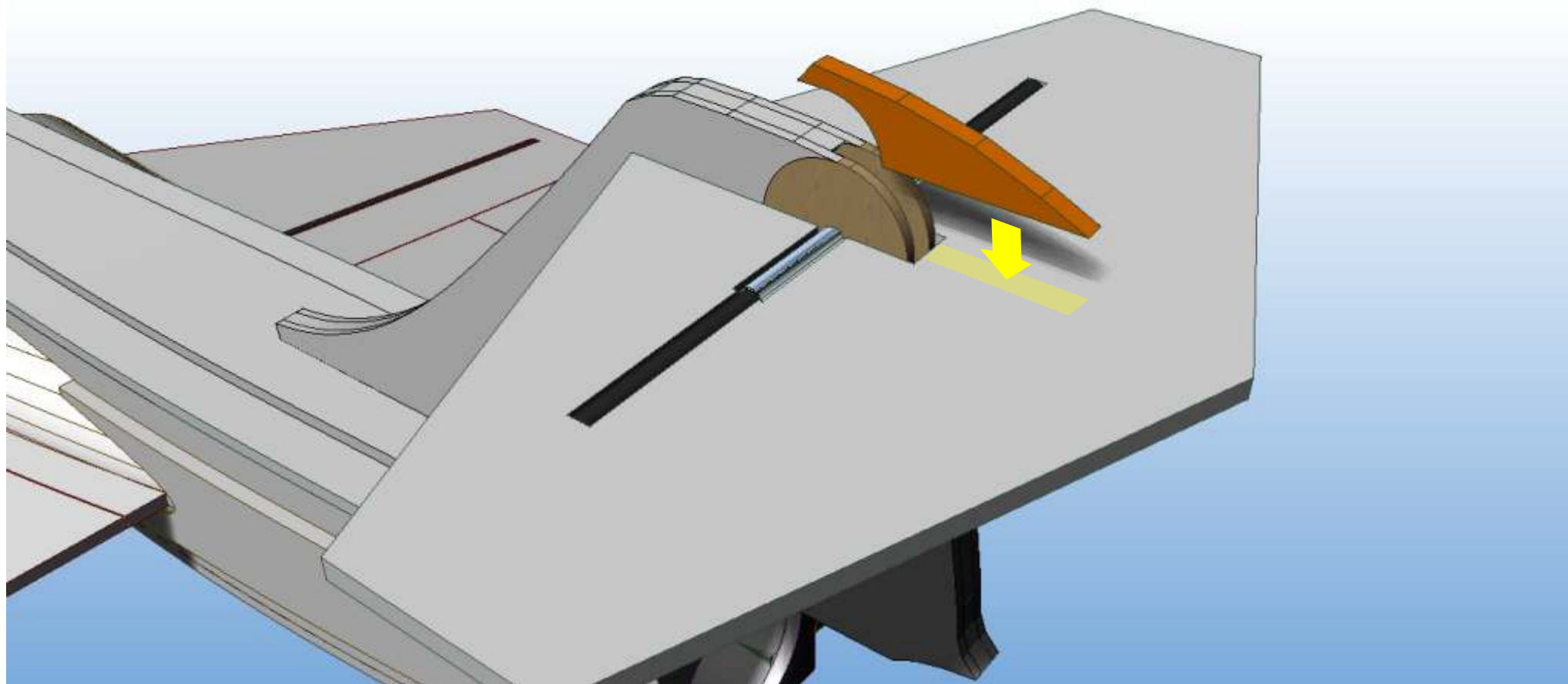






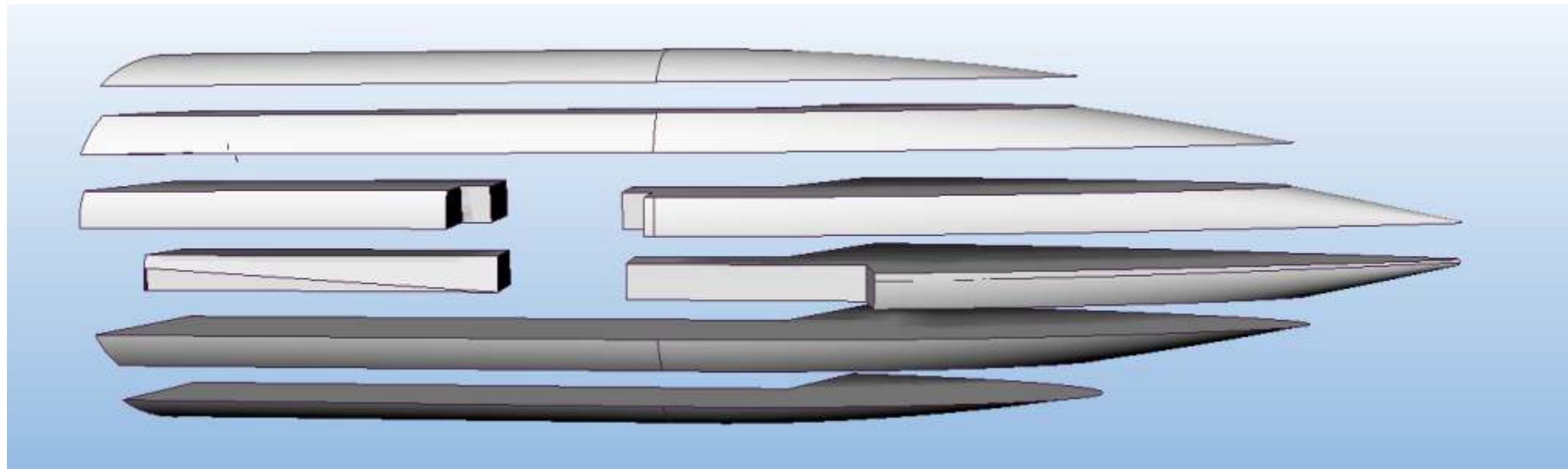
Thread the carbon rod into the aluminium tube. Glue the horizontal stabiliser to the carbon rod - without getting any epoxy near the aluminium.

Ensure that the elevator can rotate freely.

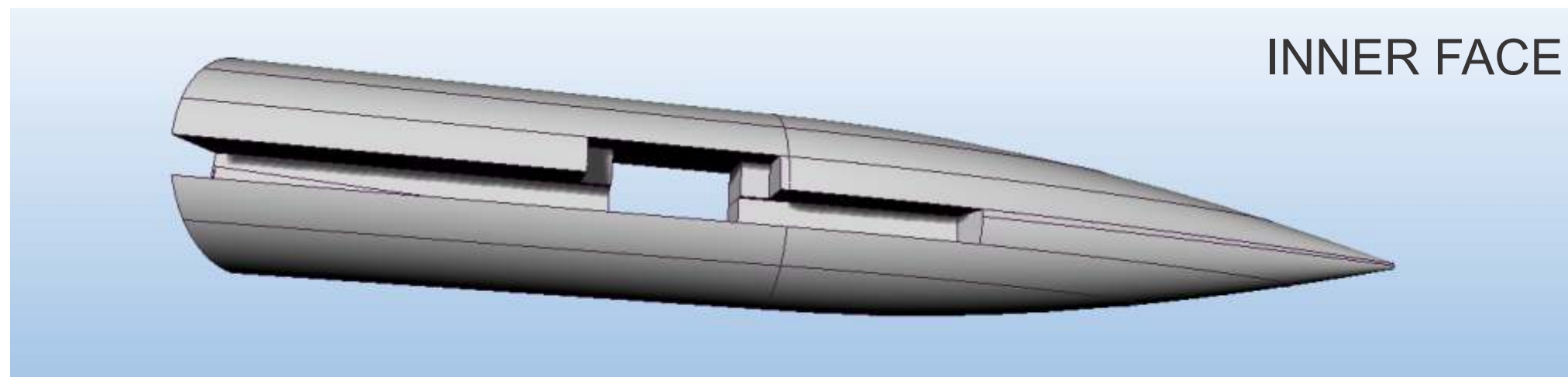


Glue the trim piece onto the elevator so that it travels with the elevator.

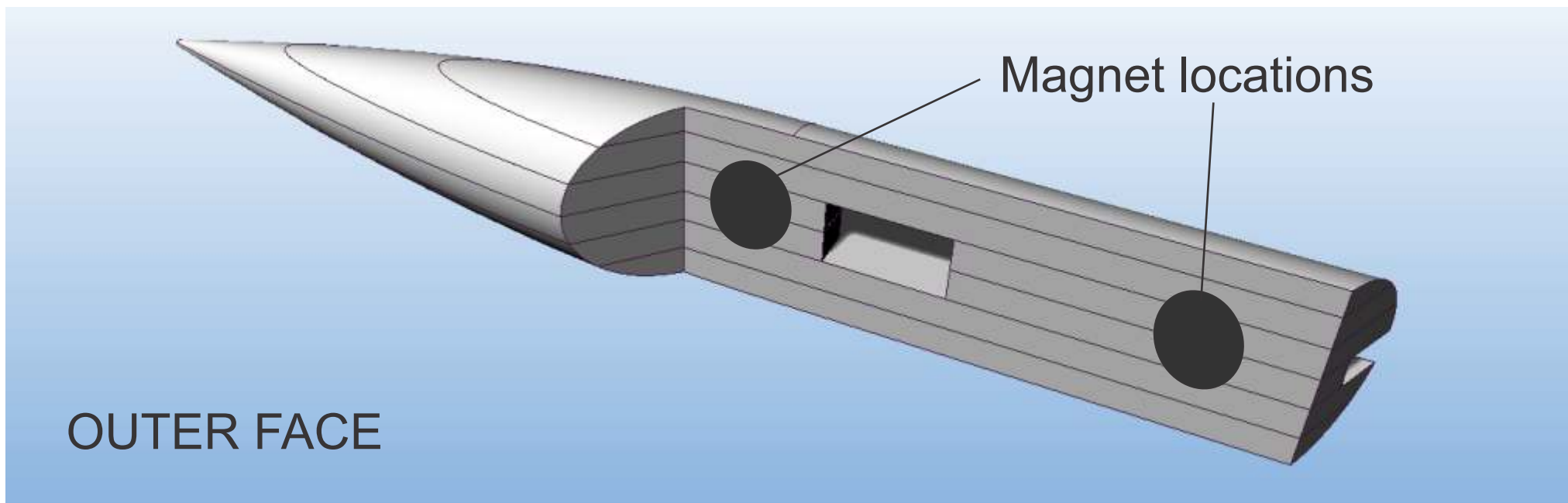




Glue the rear part of the wing tanks together as shown. sand to shape.



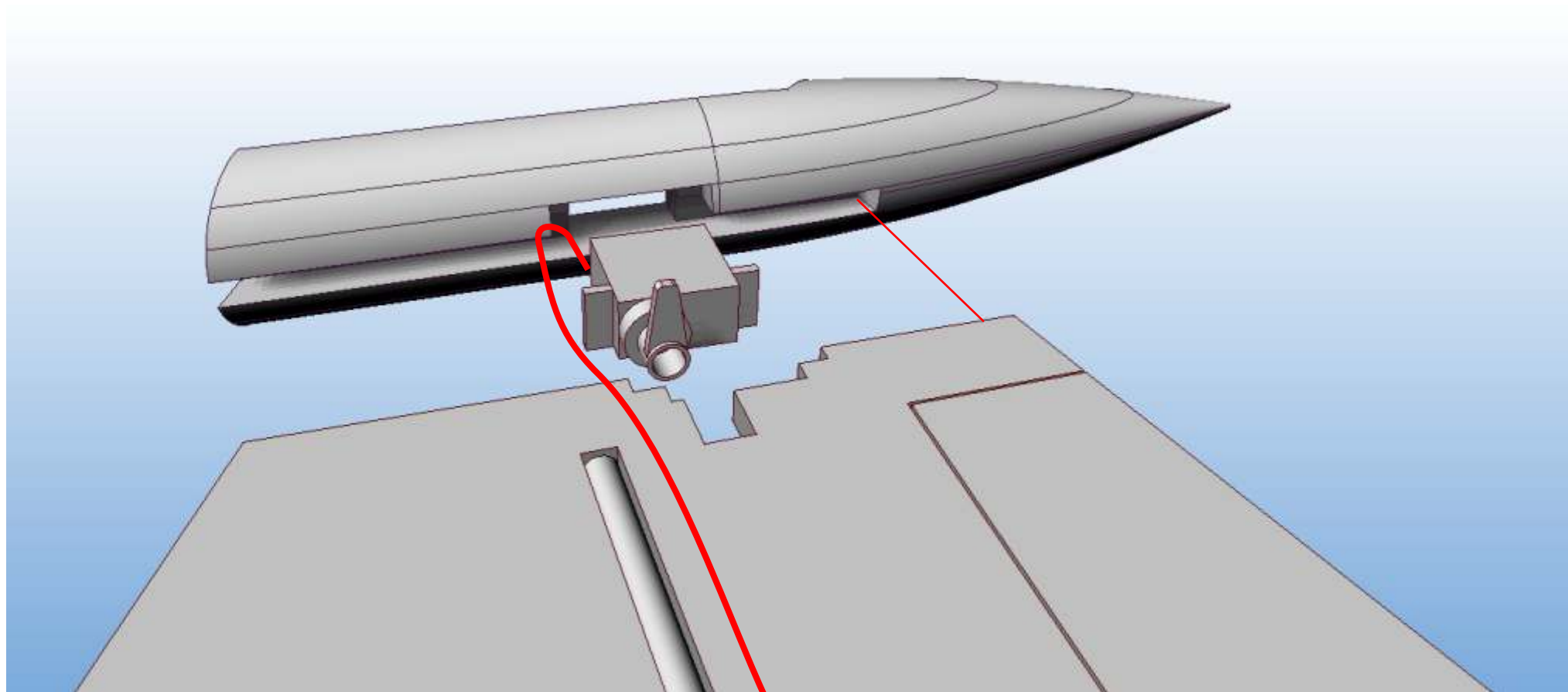
INNER FACE



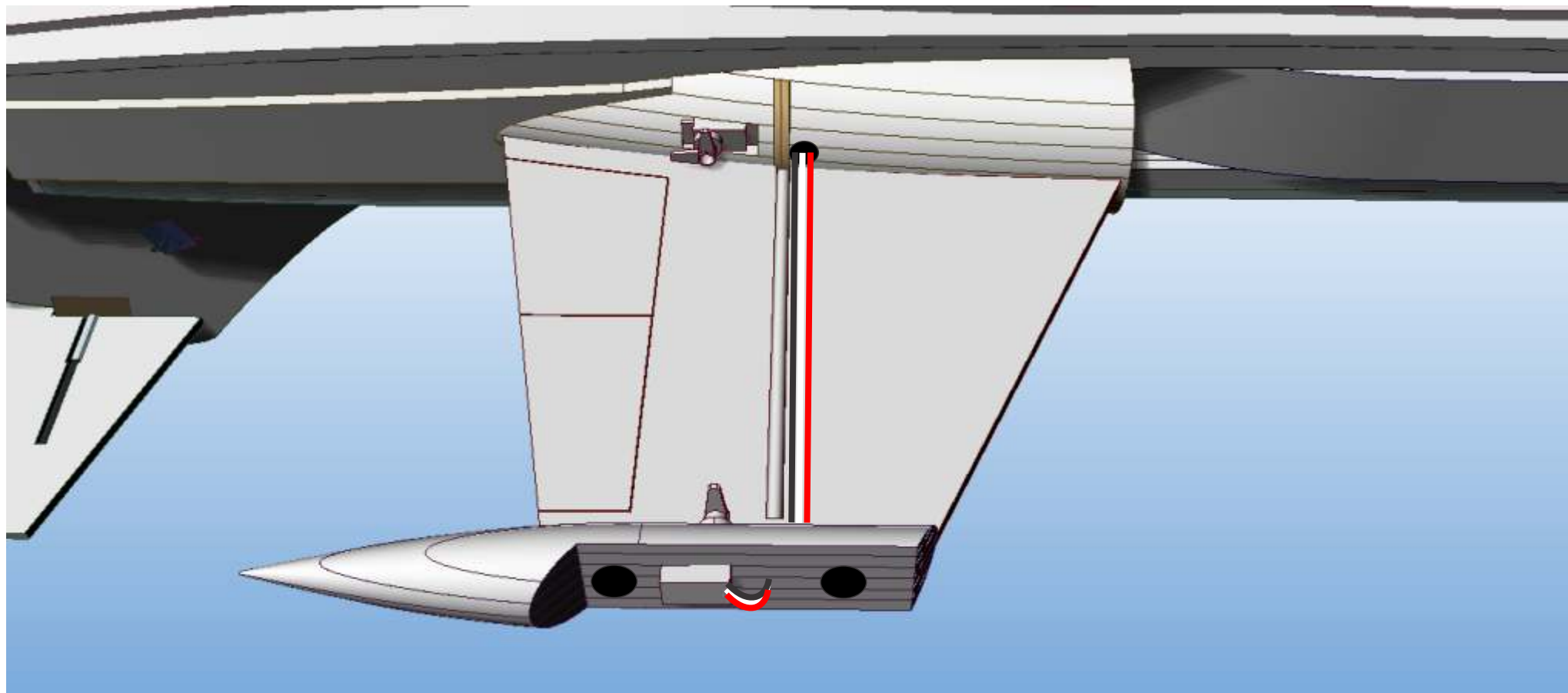
Glue in the magnets in the same way as the canopy located as per the image.

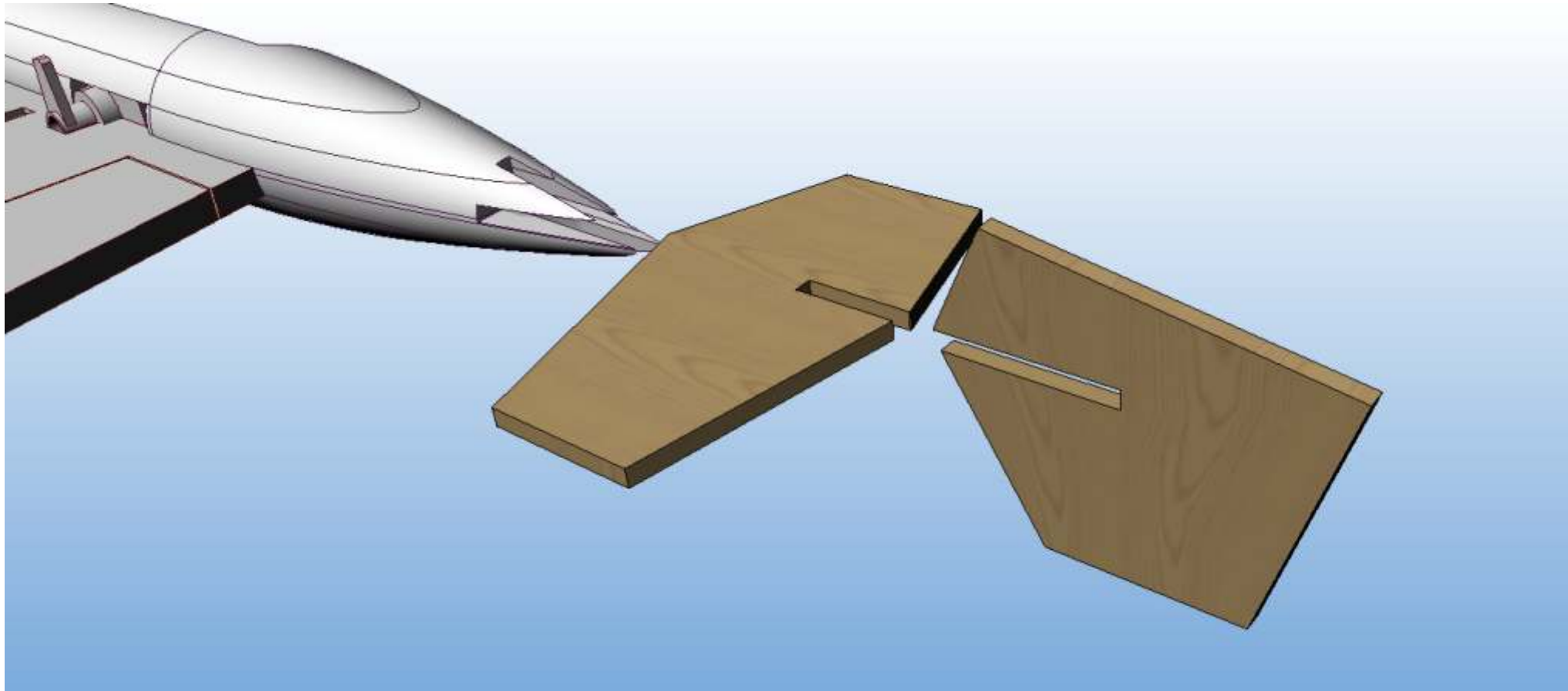






Hot melt the servo into the rear wing tank, and run the servo cable flat over the wing. Stick the servo cable to the wing using nylon reinforced tape.

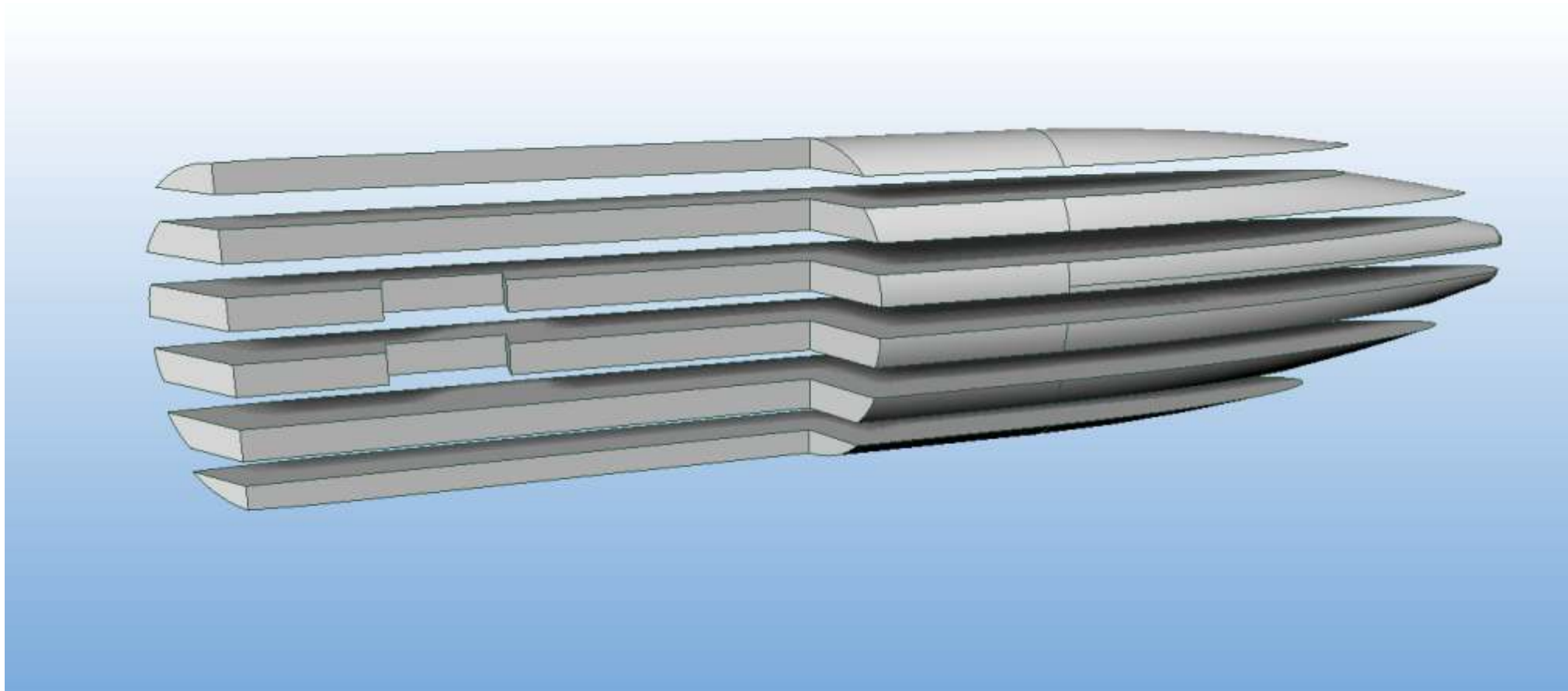




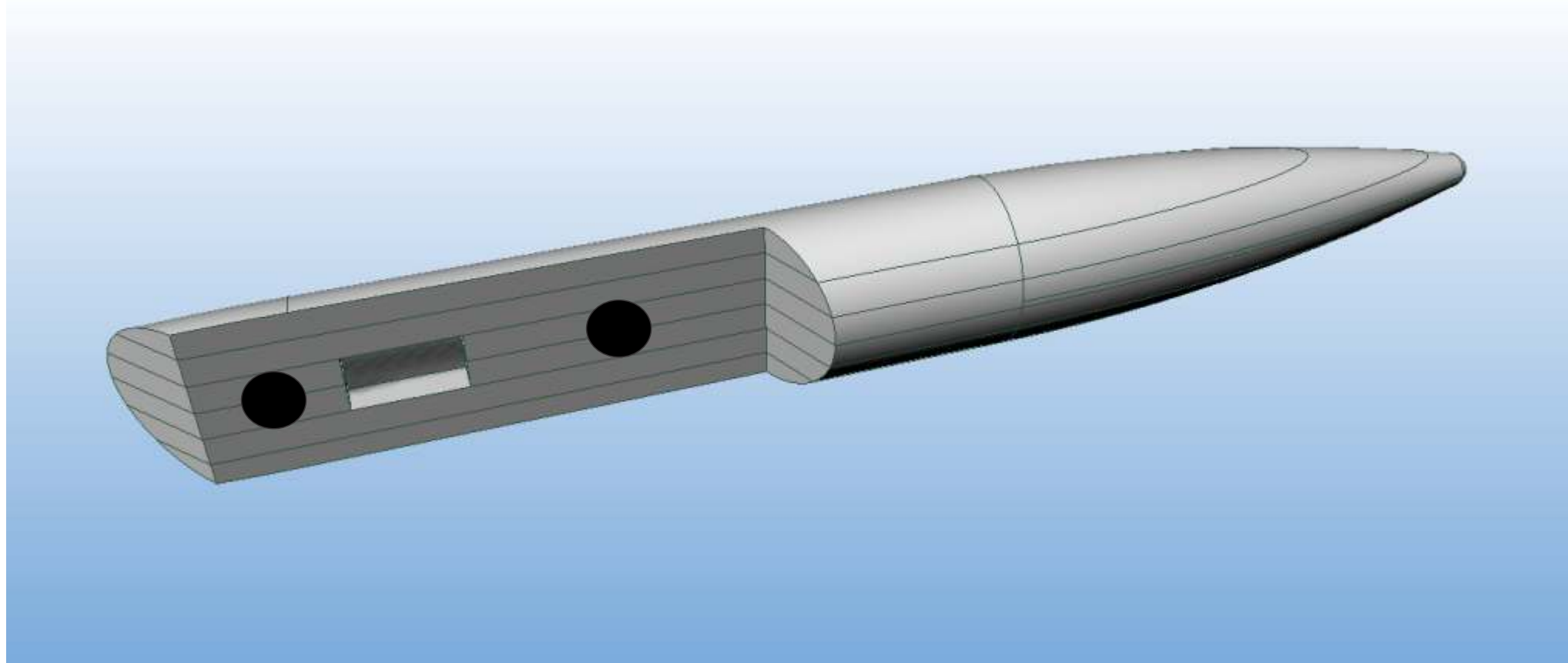
Construct the 2mm Lightply parts and slice the end of the rear wing tank to receive them.



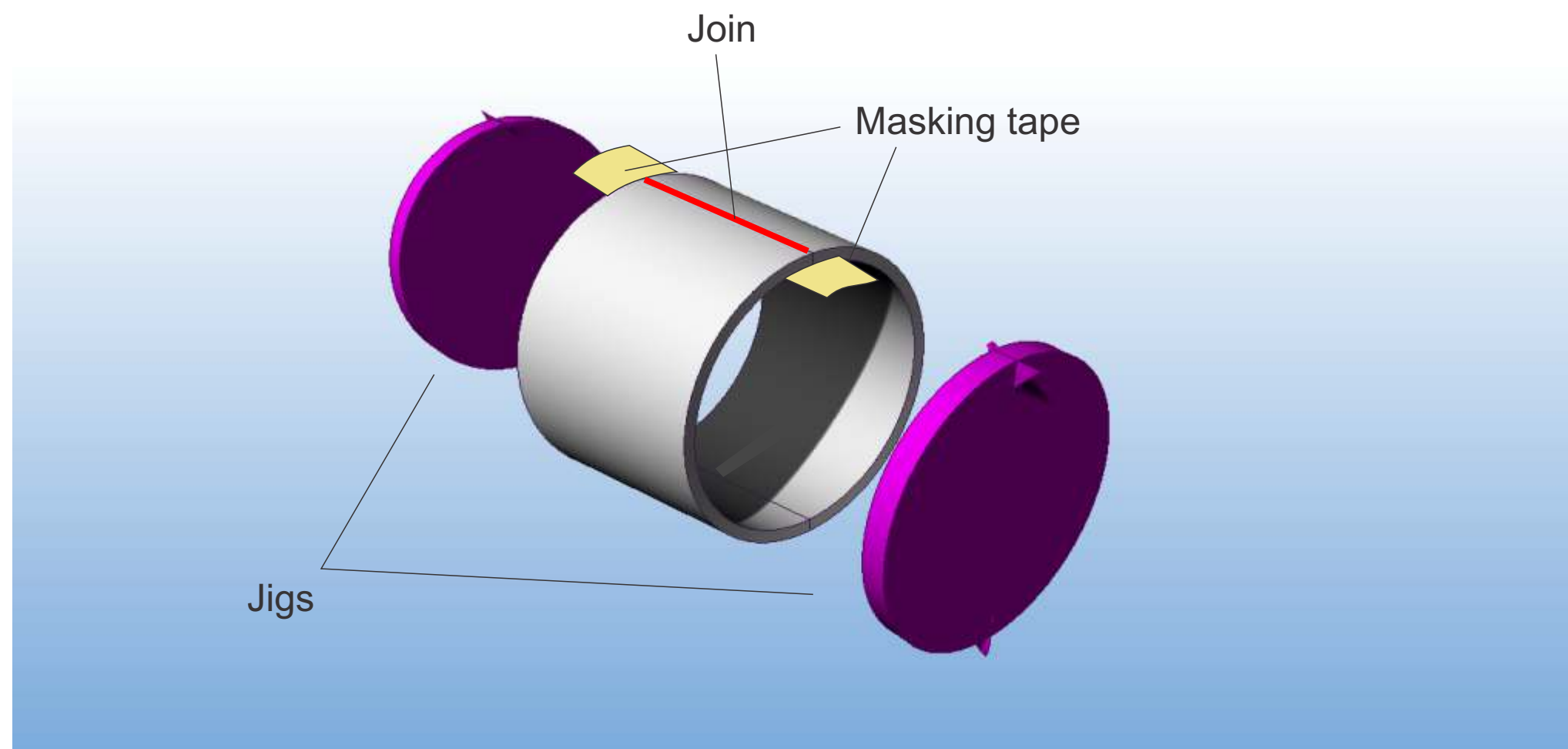
Stick the forward wing tank pieces together as shown





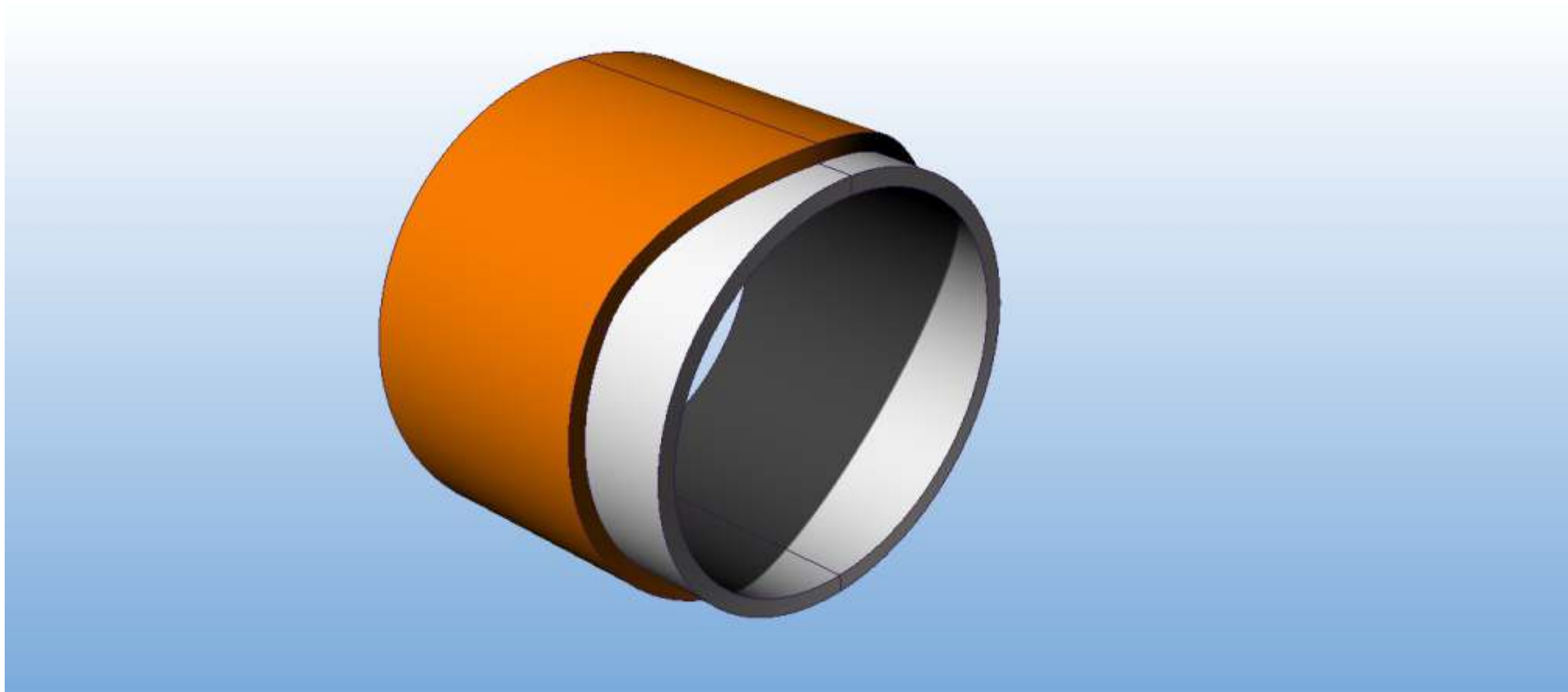


Glue the magnets into the forward wing tank as shown.

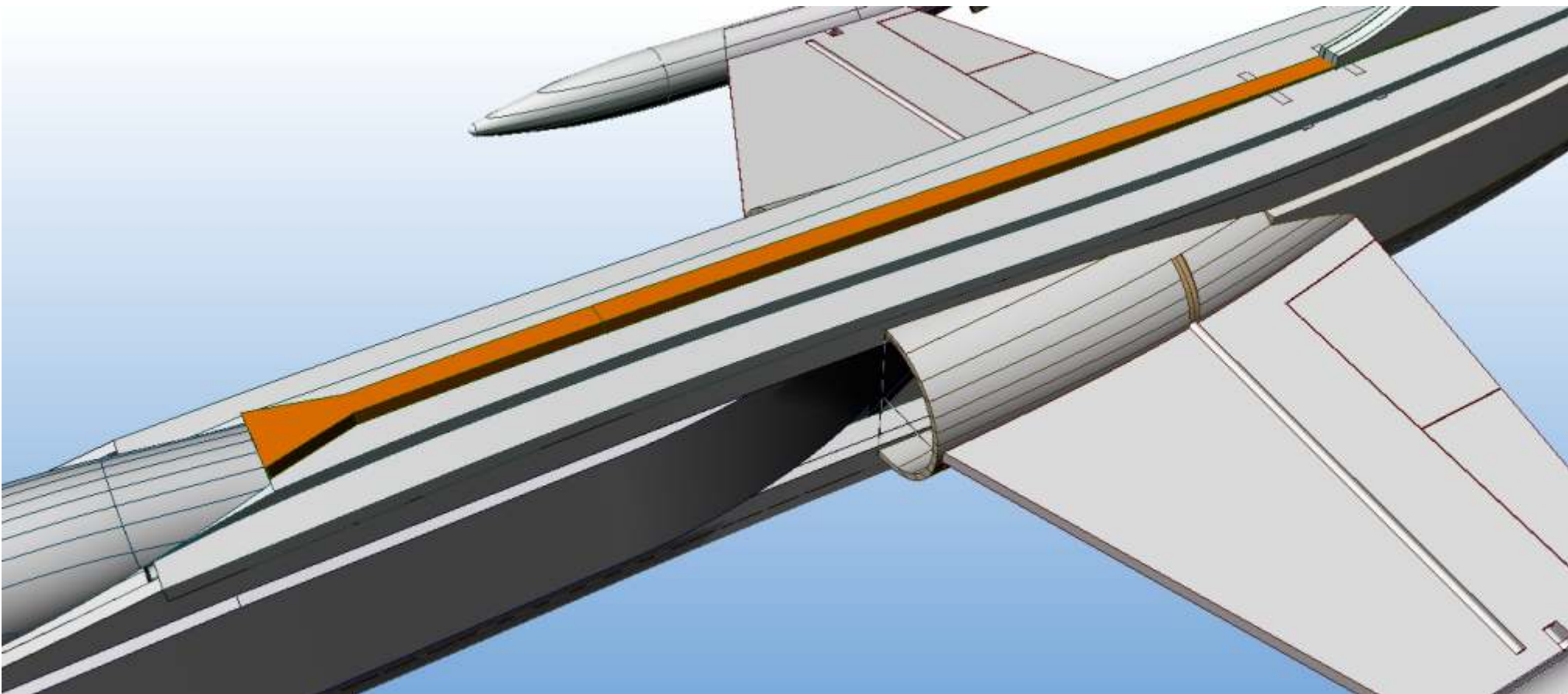


Create the 3mm inner exhaust using the jigs.





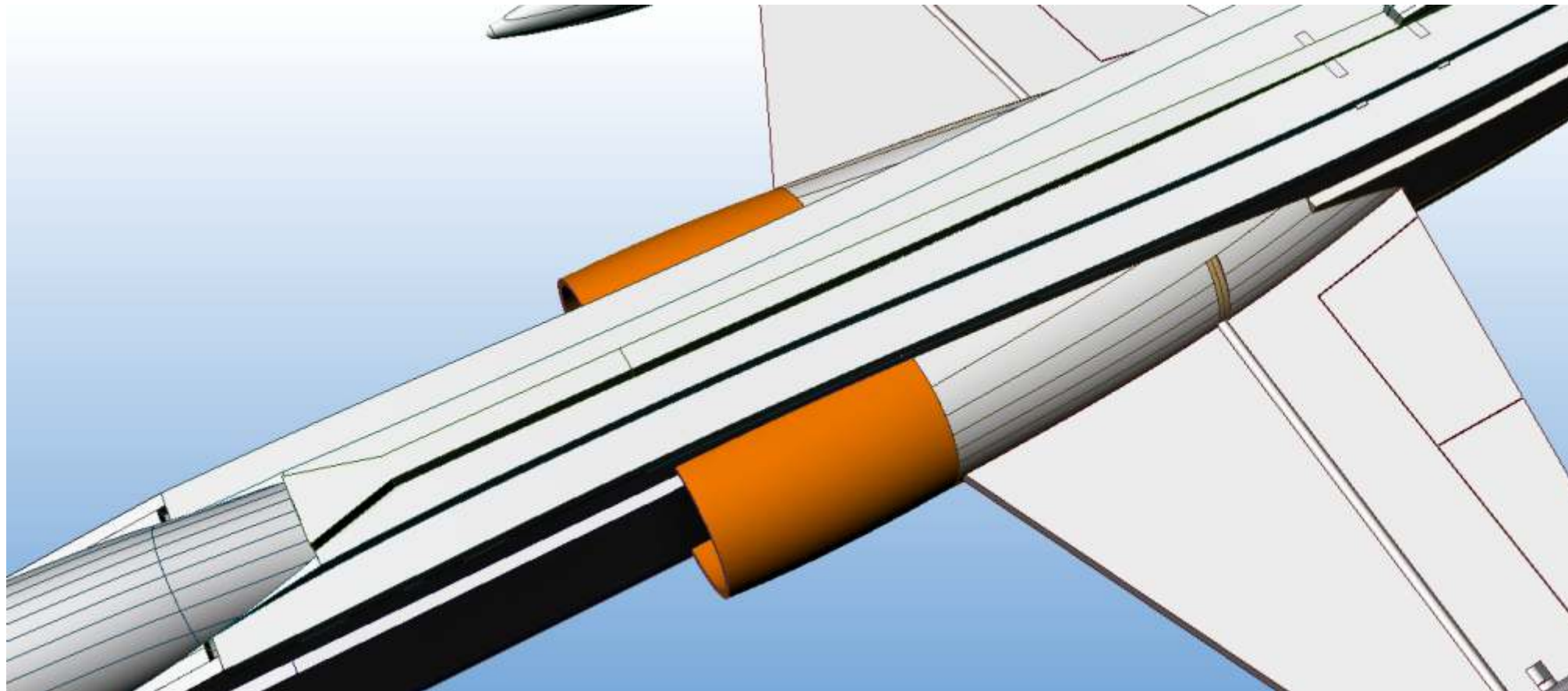
Glue the outer 3mm depron in place with the join on the opposite side to the inner depron exhaust piece.



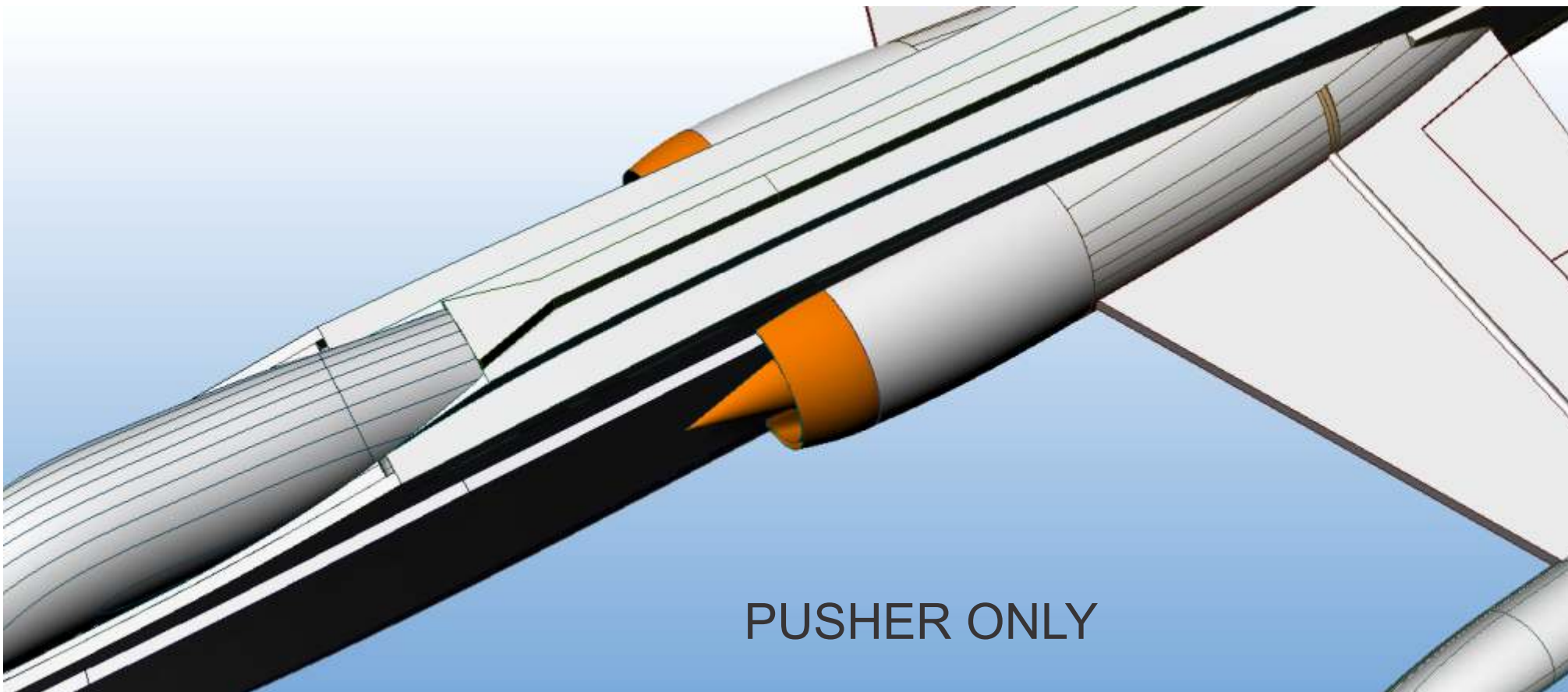
Glue the Turtledeck ridge in place as shown. Sand the transition between the canopy and the rest fuselage - refer to photos of the real plane as a guide.







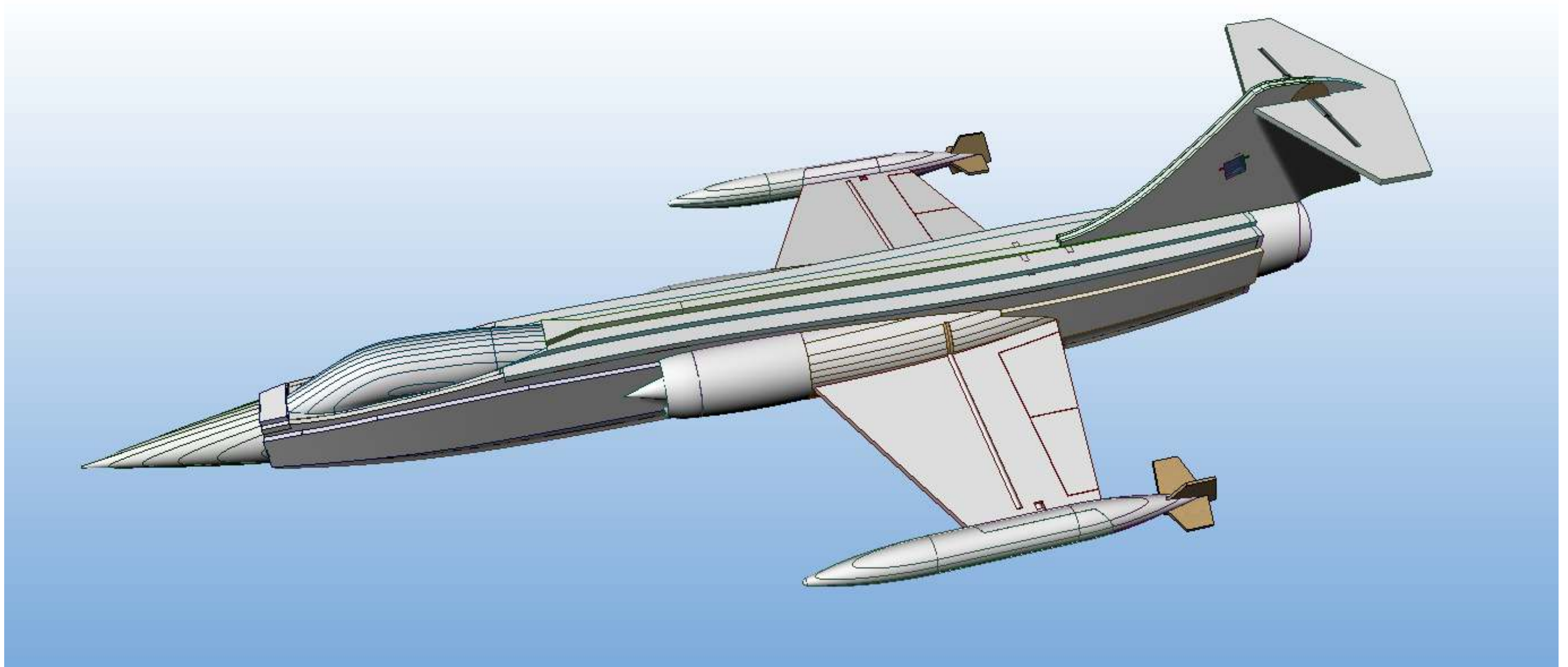
Shape the air intakes using the air intake jigs and glue in place.



PUSHER ONLY.

fashion the splitter, and glue the forward air intake pieces in place as shown,





Congratulations! You have finished  
your Starfighter..







Use Google images to help you find your favourite Starfighter and to add scale details and paint schemes! there are so many to choose from!

