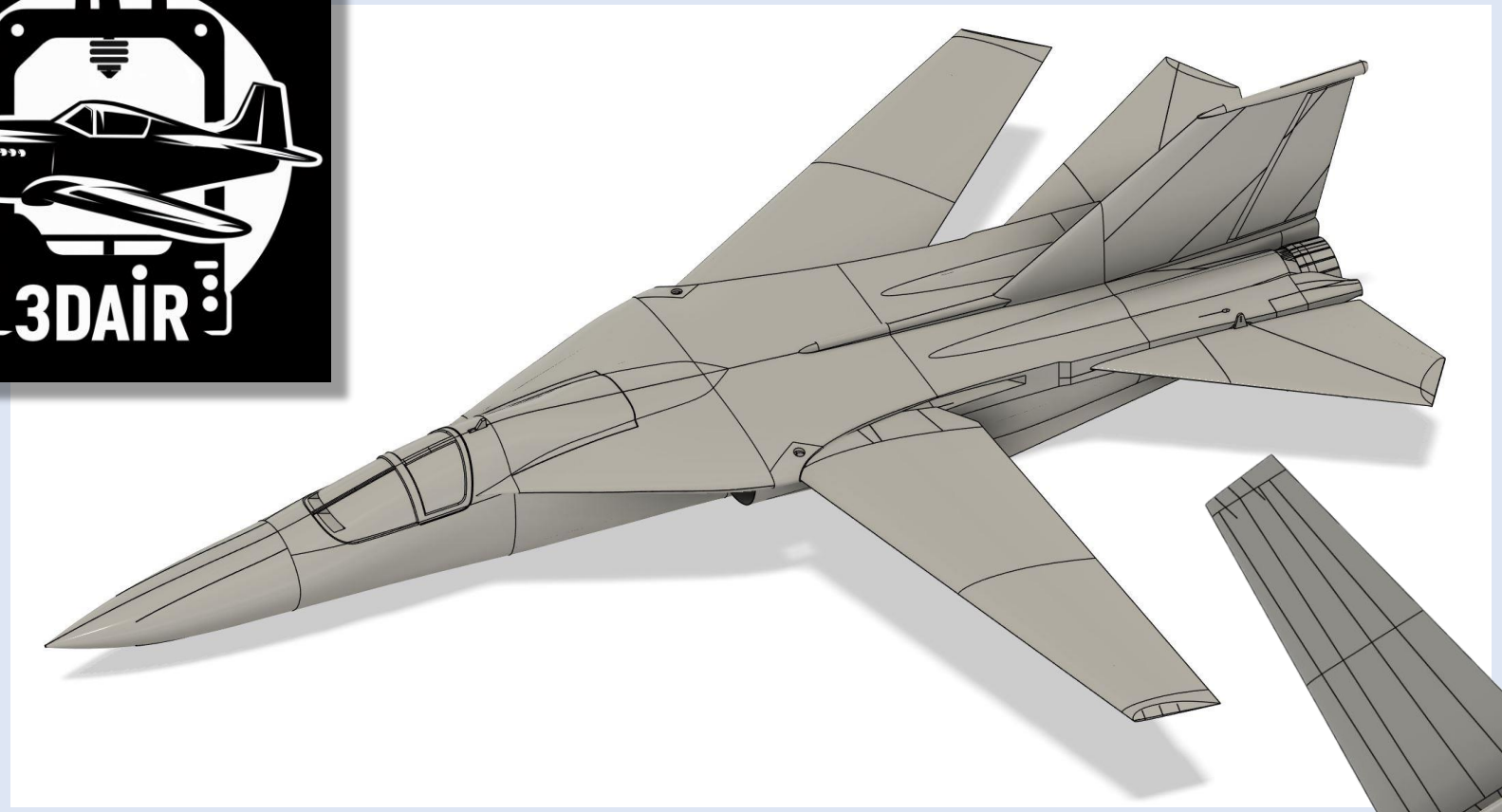
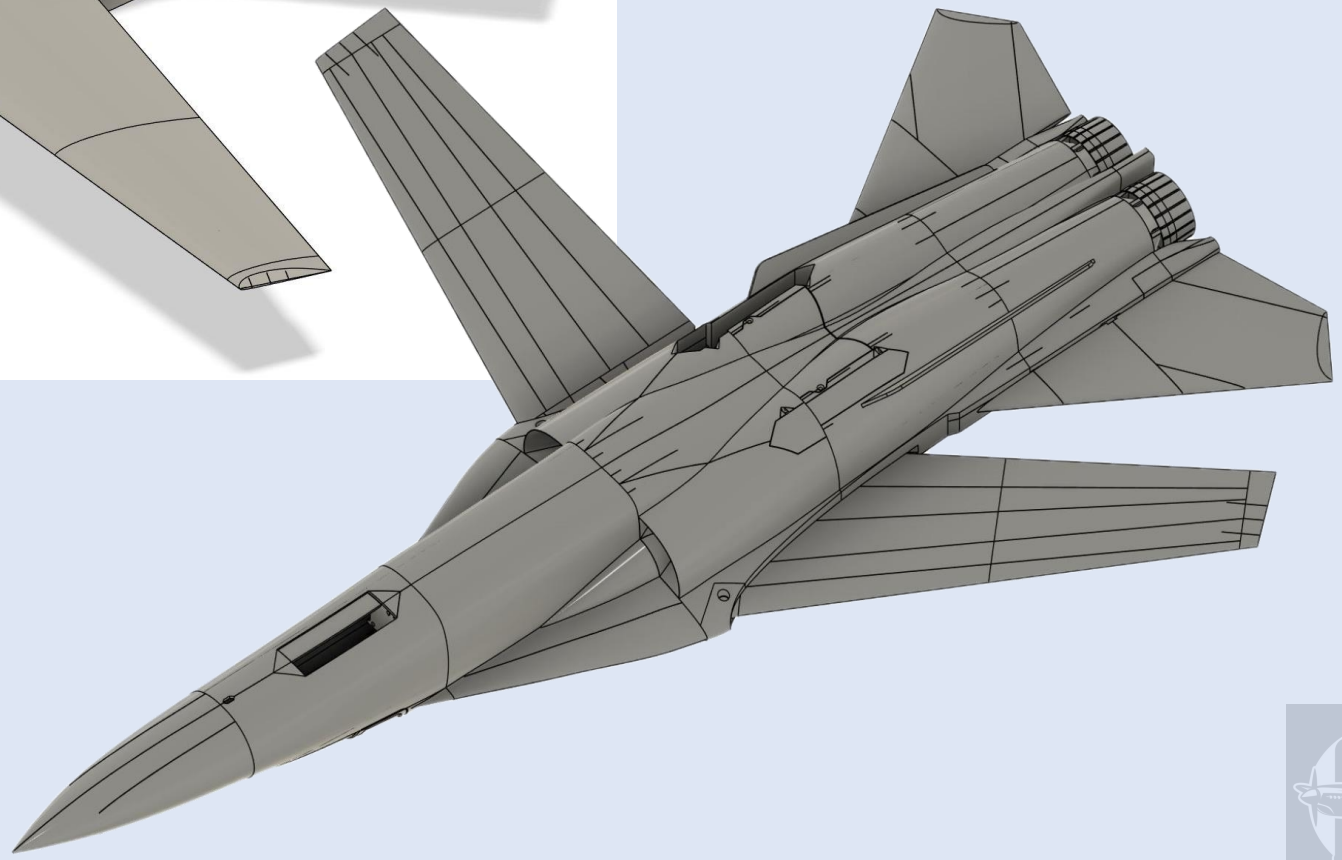




F-111 Aardvark

3D Printed RC EDF Model

Build Manual

SPECS

- 1200mm span (47in)
- 1350mm length
- 64mm EDF unit
- Servo driven Swing-Wing mechanism
- Elevon control w/ optional Rudder
- 2 Versions included
  - No undercarriage : ~1kg AUW
  - With Undercarriage : ~1.7kg AUW
- LW-PLA for most of model, PLA+ for select
- Optimised for Spiral / Vase print mode

Notes

- Suits 3D Printer with minimum Bed size of approx; 220mm square or 300mm round (Check *SmallerBed* folder for possible alternate STLs)
- This model is not recommended for a first-time builder. This manual assumes you already have basic modelling skills and are familiar with printing, assembling, fitting-out and flying 3D Printed model aircraft.
- Check hosting sites (like CULTS3D.com) and RCGROUPS.com/3D Printed Planes for news and updates (LINK)
- And please share your masterpieces photos and flight videos with the community. I only started making 3D printed models because of what I saw others doing …
- While I enjoyed spending many 100's of hours designing this model, I'm selling the files for a very small amount, so please don't distribute copies of the files

PARTS

Electric Ducted Fans – 64mm

1 off either;

- FMS 3S or 4S 11 blade
  - 3900 or 3150KV
- QX-Motor 3S-6S 12 Blade
  - 2200 or 2400KV
- ESC to suit (typically 50-80amp)
- Motor lead extensions ~400mm
- With no undercarriage - recommend 3S-4S
- With undercarriage – recommend 4S-6S

Battery – Typical

- 1400mAh to 2600mAh
- Approx. 200 grams to 340 grams
- Shorter/fat drone batteries will also fit

Fittings – Typical

- Spring Wire for various : 1.6-1.8mm dia. – approx. 200mm
- Spring Wire for Undercarriage / 3mm typical
- 2x E/Z Connectors or similar for Elevon Horns
- 4x Dubro type hinges for Nose Gear Doors
- 4mm wooden dowel

Carbon

10mm Tube

- Swing Pivots: 10 x 8 x 32mm (2)

8mm Tube

- Wings: 8 x 6 x 465mm (2)
- Idle Gear: 8 x 6 x 26mm (1)

6mm Rod/Tube

- Elevons: 6 x 120mm (2)

4mm Rod

- Wings: 4 x 120mm (2) optional

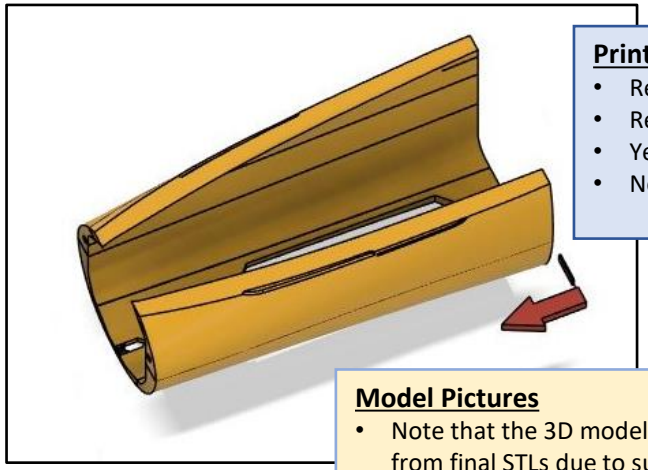
Servos

- 1x Hitec HS645MG (Swing Wing)
  - Optional Travel Expander/Tuner
- 2x Towerpro MG91 (Elevons)
  - 2x ~500mm extension leads
- Optional : 1 or 3 microservos for Retract Doors

Electric Retracts

- 1x set of 25 gram retracts with steerable nose gear
  - Often found at AliExpress
- Wheels - 2x 52mmx14mm (max) / 2x 35mmx9mm
  - 3mm Spring Wire

Typical Arrangements



Printing Orientation
- Red Arrow BASE = Print Bed
- Red Arrow Direction = Z Axis UP
- Yellow indicates component focus
- No Arrow = Pick simplest print arrangement

Model Pictures
- Note that the 3D model pictures may vary slightly from final STLs due to subsequent improvements

Coloured Guides

Do Not Glue

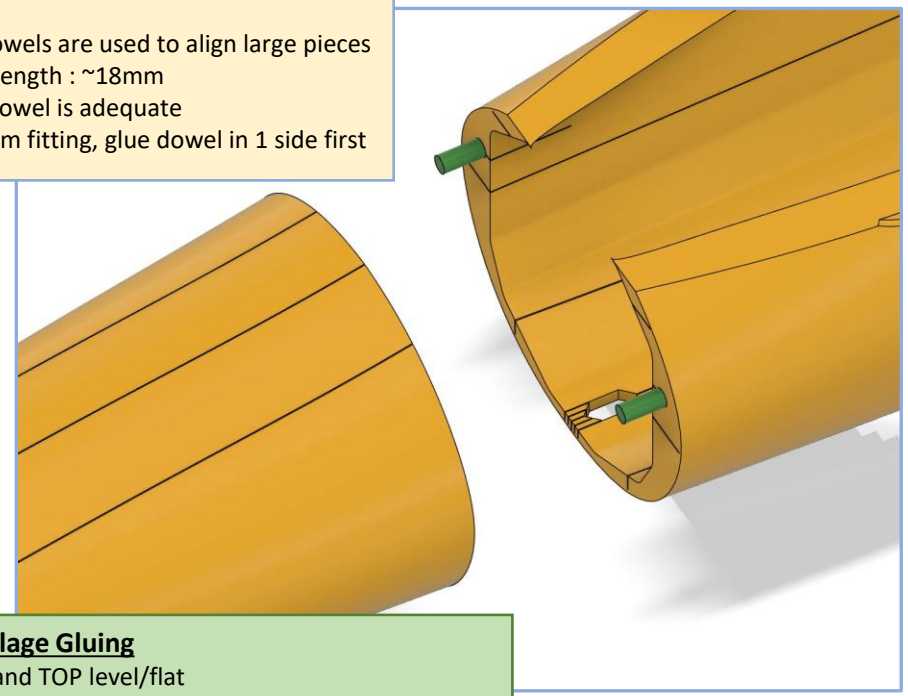
Glue

- Print Parameters

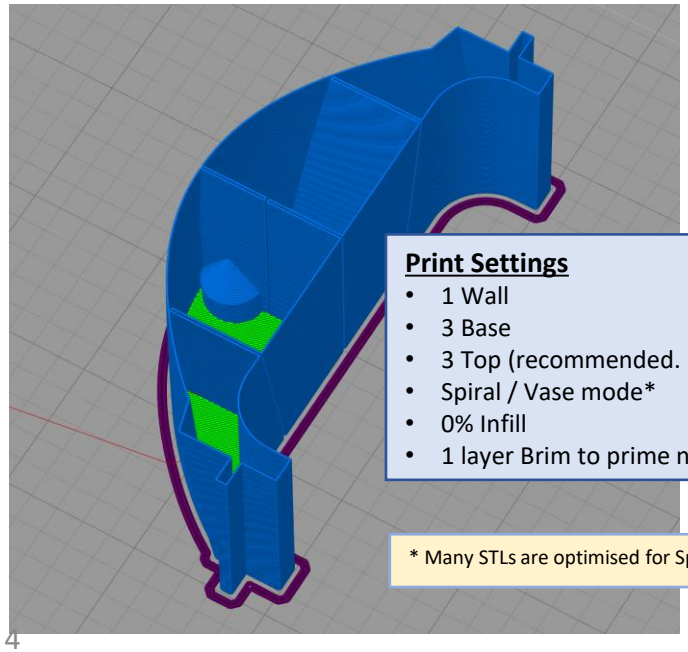
STL file name

INFO

Doweling
- 4mm dowels are used to align large pieces
- Typical length : ~18mm
- Wood dowel is adequate
- If not firm fitting, glue dowel in 1 side first



Fuselage Gluing
- Sand TOP level/flat
- Apply CA to only where faces touch
- Use dowels to align
- Apply firm pressure
- Use Accelerator if preferred



Print Settings
- 1 Wall
- 3 Base
- 3 Top (recommended. 0 may work)
- Spiral / Vase mode*
- 0% Infill
- 1 layer Brim to prime nozzle

* Many STLs are optimised for Spiral / Vase mode

Notes
* Many STLs are optimised for Spiral / Vase mode.
While most main body STLs recommend 3 TOP LAYERS for strength reasons, in most cases this could be reduced to 0/zero.

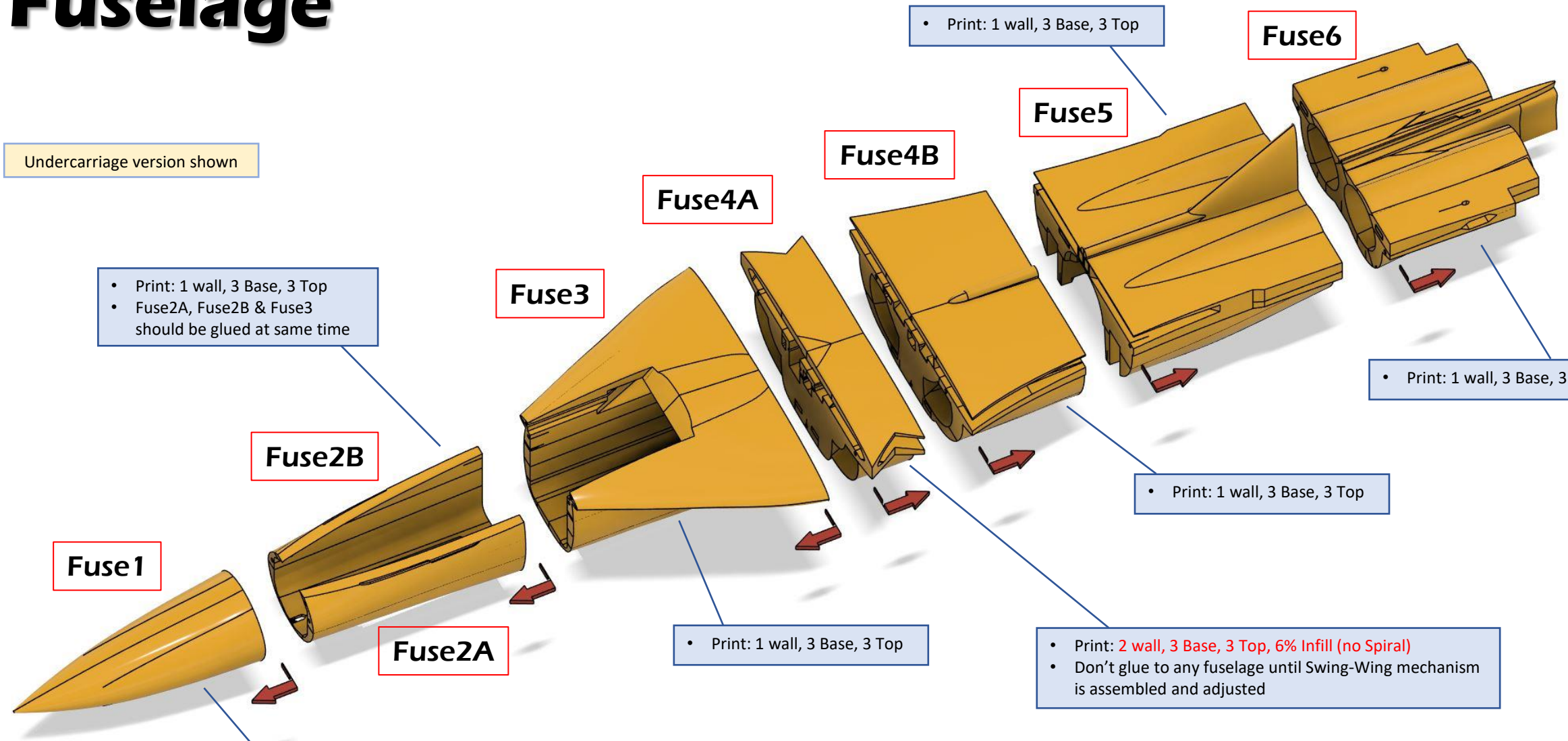
Typical Print Settings

>>LW-PLA
- 0.4 nozzle / 0.4 width
- 0.2 layer height
- 0.6 Extrusion Multiplier
- 250°C nozzle / 60°C bed
- First Layer: 200% height & Width
- No Retraction, No Cooling

>>LW-PLA-HT
- 0.4 nozzle / 0.4 width
- 0.25 layer height
- 0.65 Extrusion Multiplier
- 230°C nozzle / 60°C bed
- First Layer: 200% height & Width
- No Retraction, 33% Cooling

Fuselage

Undercarriage version shown



- Print: 1 wall, 3 Base, 3 Top
- For ease of overall assembly don't glue to model until very END

- Print: 1 wall, 3 Base, 3 Top
- Fuse2A, Fuse2B & Fuse3 should be glued at same time

- Print: 1 wall, 3 Base, 3 Top

- Print: 2 wall, 3 Base, 3 Top, 6% Infill (no Spiral)
- Don't glue to any fuselage until Swing-Wing mechanism is assembled and adjusted

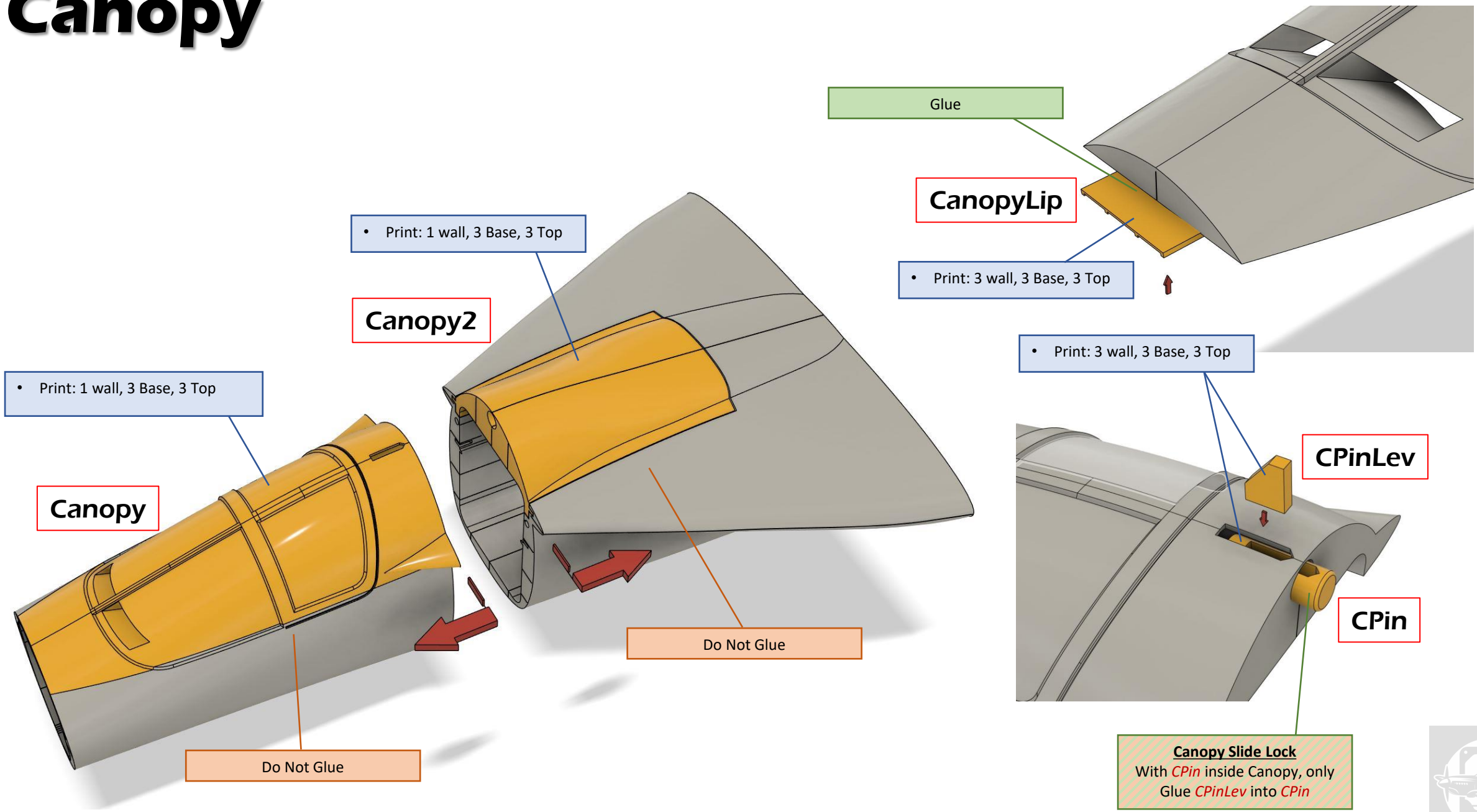
- Print: 1 wall, 3 Base, 3 Top

- Print: 1 wall, 3 Base, 3 Top

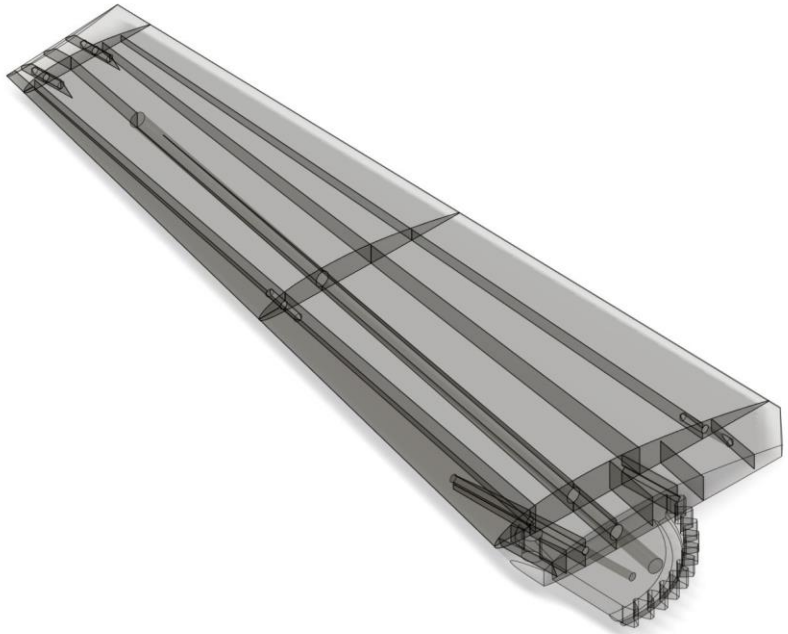
NO-UNDERCARRIAGE Version

No-Gear version can be Catapult launched. Hand-launched not tested yet.
Don't use Fuse2A, Fuse2B, Fuse4A, Fuse4B and Fuse5
Instead use Fuse2, Fuse4, and Fuse5 found in "*NoGear*" folder.
TowHook can be printed with PLA+. Add wire to make a small hook.

Canopy


Glue
CanopyLip
• Print: 3 wall, 3 Base, 3 Top
• Print: 1 wall, 3 Base, 3 Top
Canopy2
• Print: 1 wall, 3 Base, 3 Top
Canopy
Do Not Glue
Do Not Glue
• Print: 3 wall, 3 Base, 3 Top
CPinLev
CPin
Canopy Slide Lock
With CPin inside Canopy, only
Glue CPinLev into CPin

Wings



- Print: 1 wall, 3 Base, 3 Top

WingL7

Glue 4th

Glue 3rd

WingL6

- Print: 1 wall, 3 Base, 3 Top

Mirror & print any “L” parts for RIGHT wing, EXCLUDING SwingRL

Glue 5th

WingL5

WingL4

Carbon Tube & Dowels

Recommend gluing together sections in the order indicated.
CARBON TUBE : (8mm) DO NOT GLUE carbon tube inside any of these wing and swing sections. Tube needs to be removable when joining several of the joints otherwise they will not align. Also recommended if a replacement wing needs to be made.
DOWELS : (4mm) Short wooden dowels are adequate.
Optional 120mm carbon rod can instead be used between SwingRL & SwingWL1 & WingL5

Glue 2nd

Glue 1st

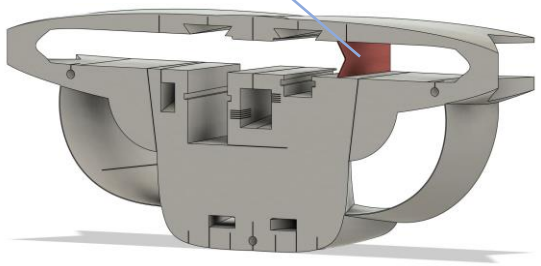
SwingWL1

SwingRL
do not mirror

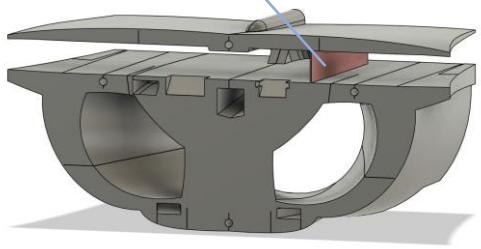
- ~~*LW-PLA*~~ - Recommend PLA+
- Print: 3 wall, 3 Base, 3 Top, 20% Infill

Fuse4A Arrangements

Fuse4A - Remove fillet after printing



Fuse4B - Remove fillet only after gluing to Fuse4A & Fuse5



All these STLs
- ~~*LW-PLA*~~ - Recommend PLA+
- Print: 3 wall, 3 Base, 3 Top, 20% Infill

(Note: top half of Fuse4A STL remove for this view only)

SwingWR1

SwingRR

Wing Root

Rack-Right

SwingGR

SwingGL

SwingRL

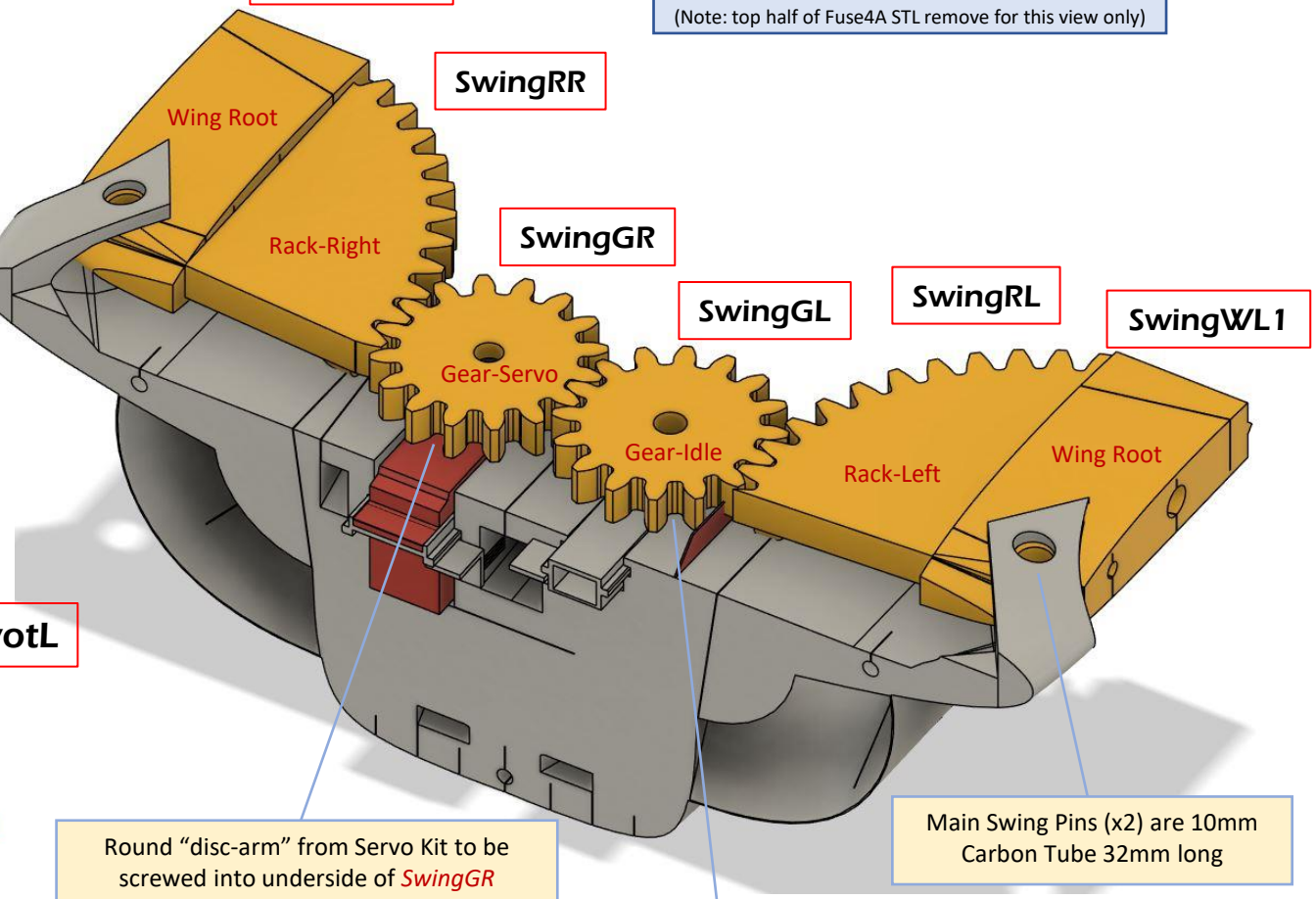
SwingWL1

Gear-Servo

Gear-Idle

Rack-Left

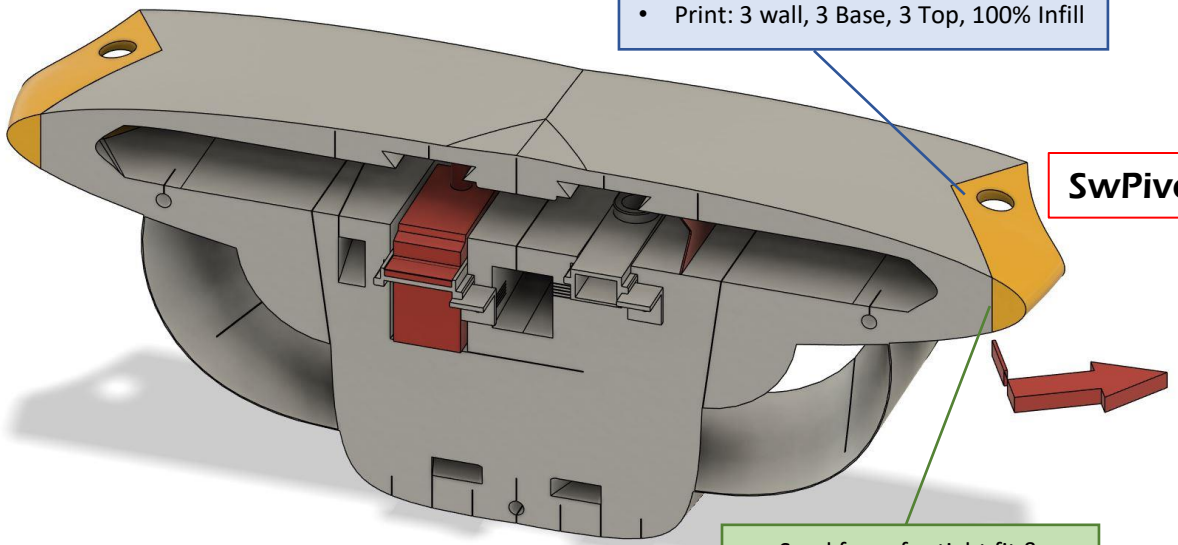
Wing Root



SwPivotL
mirror

- ~~*LW-PLA*~~ - Recommend PLA+
- Print: 3 wall, 3 Base, 3 Top, 100% Infill

SwPivotL



Round “disc-arm” from Servo Kit to be screwed into underside of *SwingGR*

Main Swing Pins (x2) are 10mm Carbon Tube 32mm long

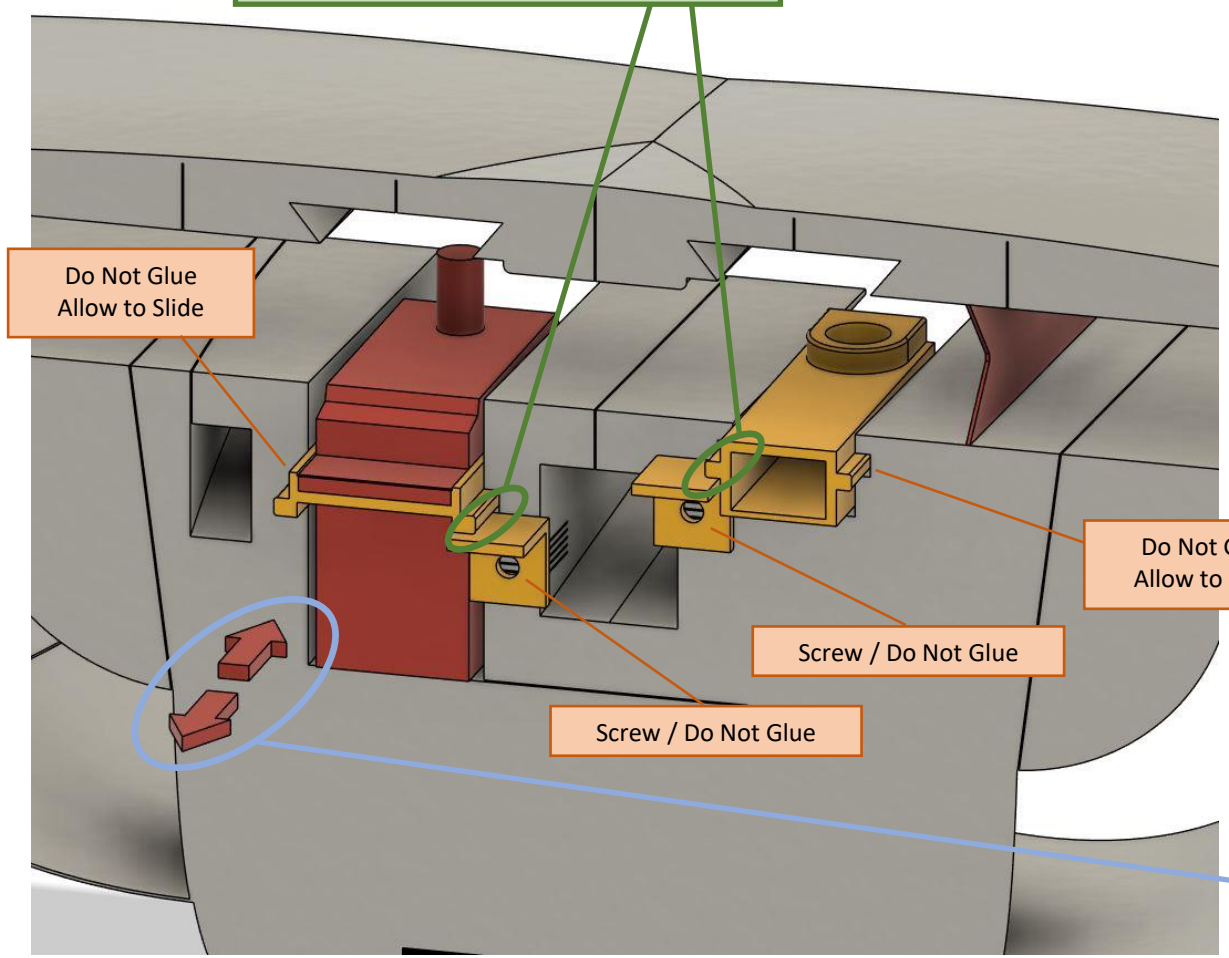
SwingGearHolder to interference-fit x1 Pin of 8mm Carbon Tube 26mm long. *SwingGL* is to freely rotate on this Pin.

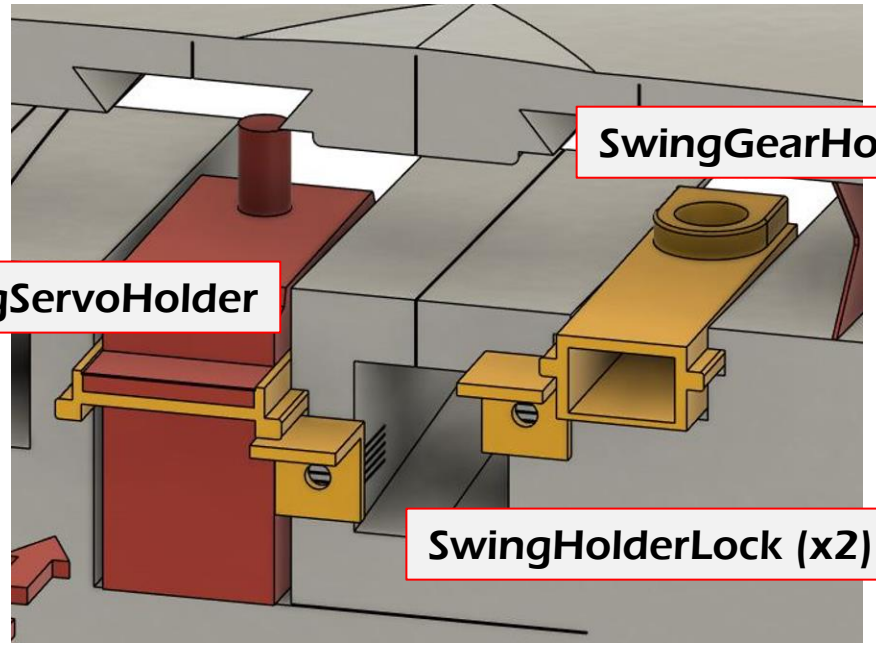
Sand faces for tight fit & Glue

Fuse4A Arrangements

All these STLs
- ~~*LW-PLA*~~ - Recommend PLA+
- Print: 2 wall, 3 Base, 3 Top, 100% Infill

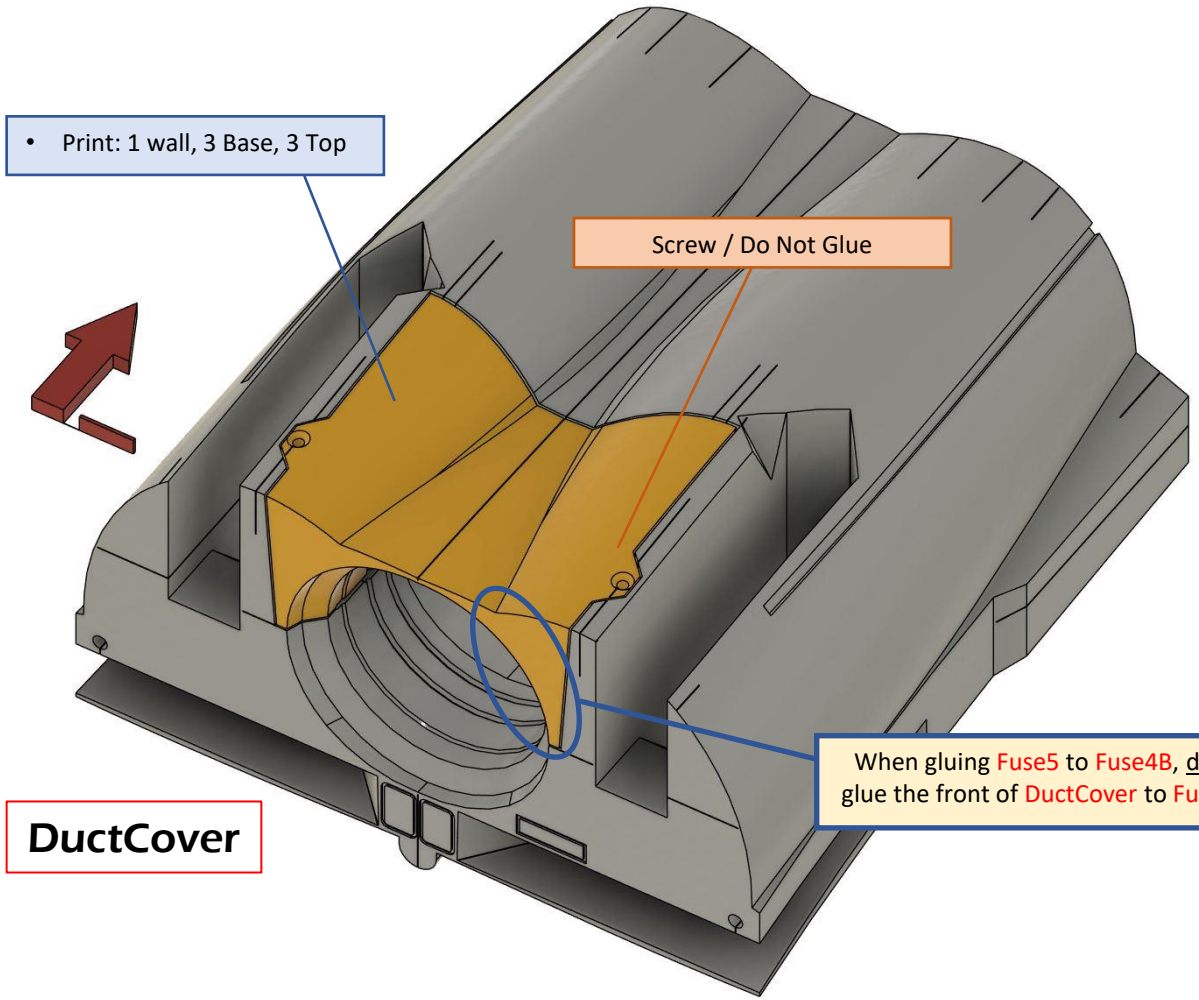
Gear Positioners
Once Gears have been adjusted, lightly GLUE each *SWINGHOLDERLOCK* to the HOLDERS



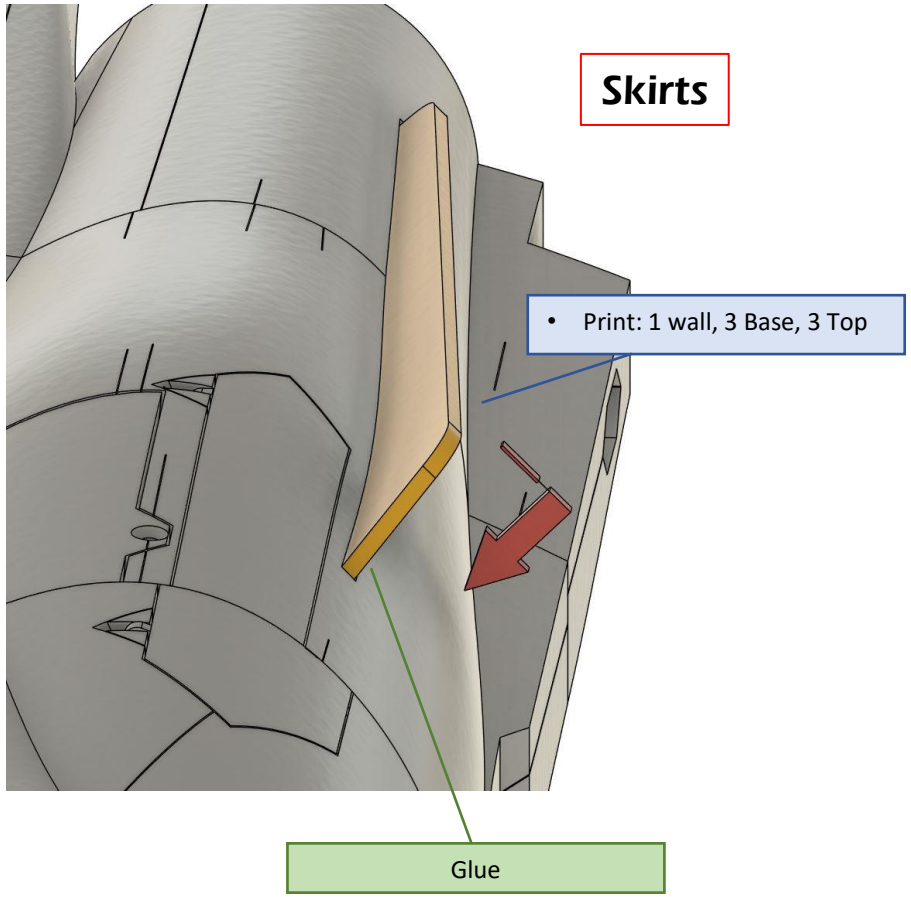


Positioning Servo & Idle Gears
Test the Servo action only once all Swing-Wing parts and both assembled Wings are in place on FUSE4A.
FRICTION : Adjust both gears in and out IN PARALLEL to achieve the right amount of friction. Too little and there will be too much free movement of the Wing. And too much will overload the Servo
POSITION : Adjust servo limits such that FULL FORWARD (without jamming) is one end of servo travel, with whatever the other end allows being rearward swing. Servo Travel Extender could be used for additional swing.

Fuse5 Extras



x2



Note
- Skirts cross both Fuse5 and Fuse6

EDF Mounting

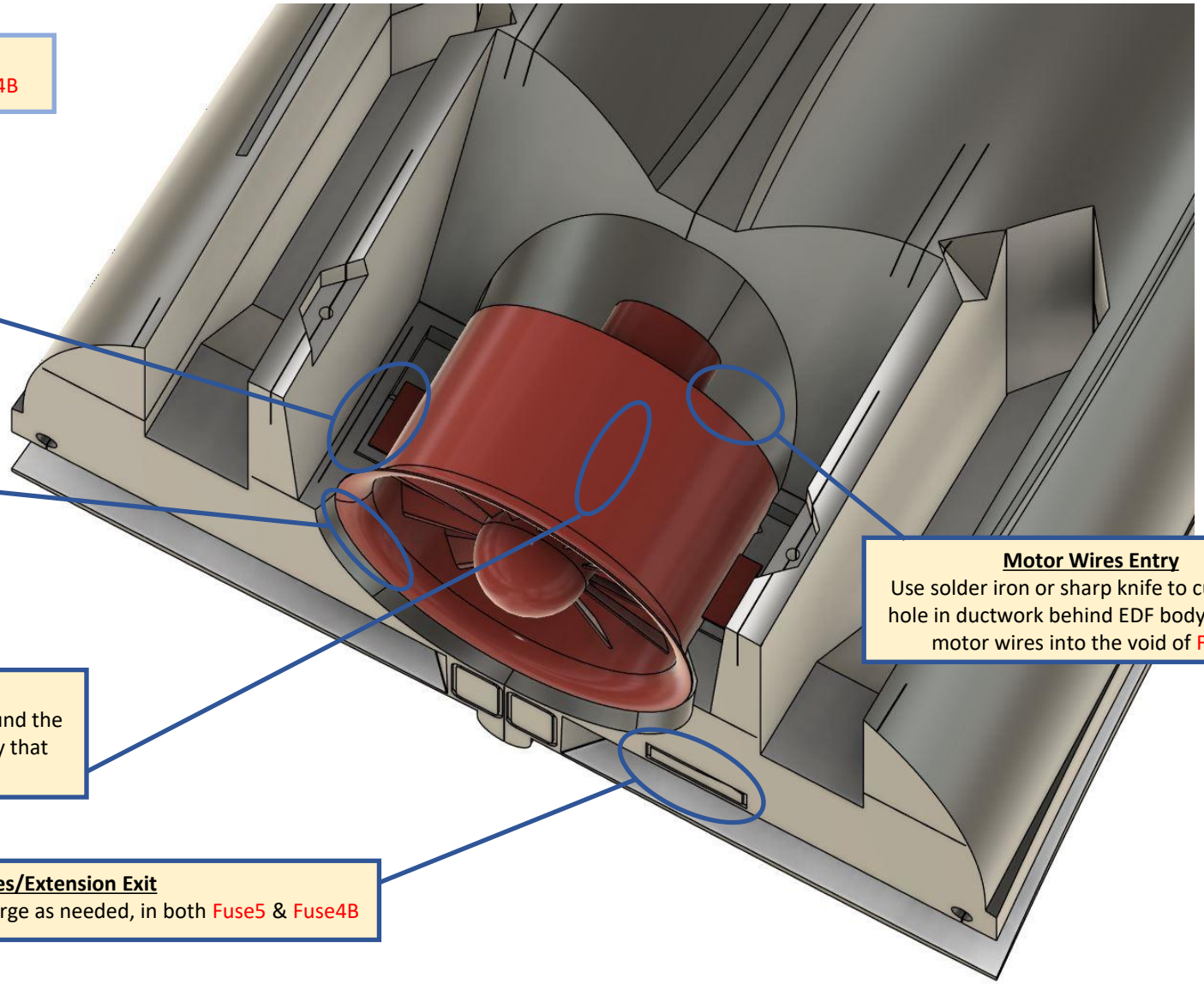
Assembly sequence
EDF should be installed in Fuse5 before Fuse5 is glued to Fuse4B

EDF Mount Tabs
Reinforced clearance areas are provided to accommodate the typical EDF body mounting tabs of all brands of EDF mentioned in the parts section. Choices could include screwed or hot-glued. Or physically restrain the unit using extra plastic glued in front of Tabs. Test fit with DuctCover to ensure flush fit.

EDF Position
Leave the bellmouth (curved inlet) in place on the EDF body and slide the unit rearward until the bellmouth touches/seals to the Fuse5 body (& DuctCover). These provide more efficiency operation.

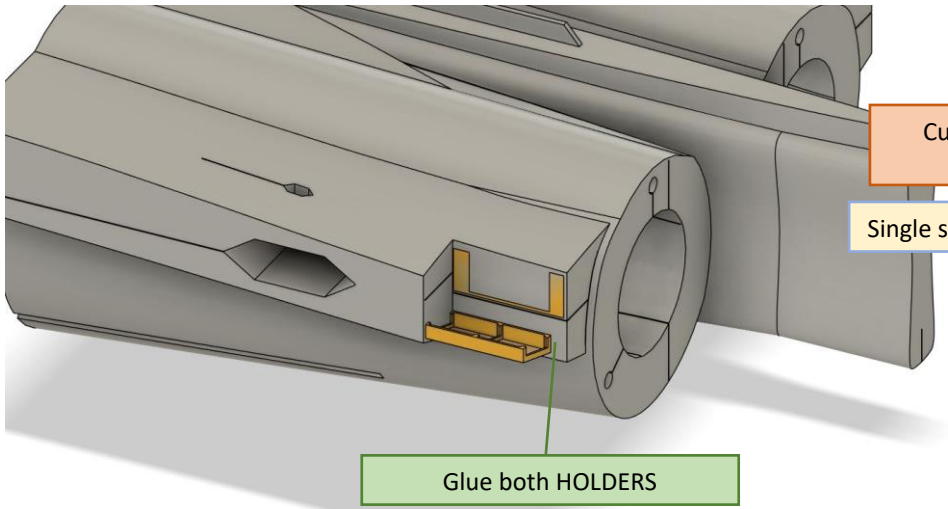
FMS Unit
The 4S FMS branded unit has several circumferential ribs around the outside of the body. Grooves are provided in the Fuse5 body that should accommodate and avoid mounting issues.

Motor Wires/Extension Exit
Remove panel / cut opening as large as needed, in both Fuse5 & Fuse4B



Motor Wires Entry
Use solder iron or sharp knife to cut a small hole in ductwork behind EDF body, allowing motor wires into the void of Fuse5

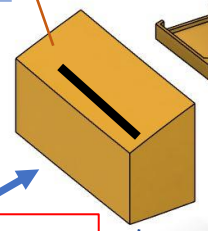
Elevons – Servo setup



Glue both HOLDERS

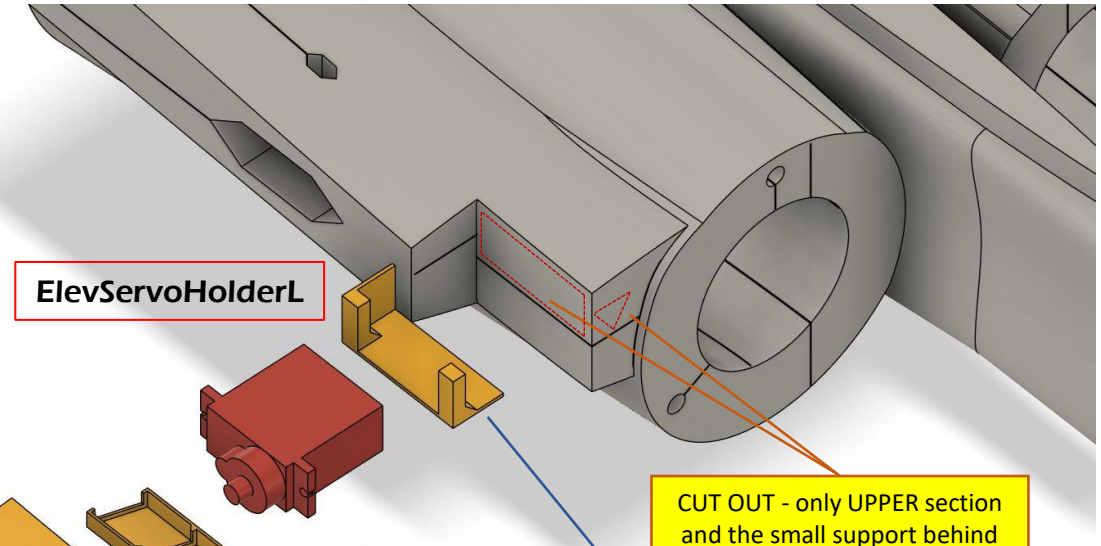
Cut slot to suit servo arm
Do Not Glue

Single screw to hold ElevCoverL



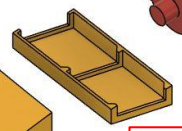
ElevCoverL

- Print: 1 wall, 3 Base, 0 Top



ElevServoHolderL

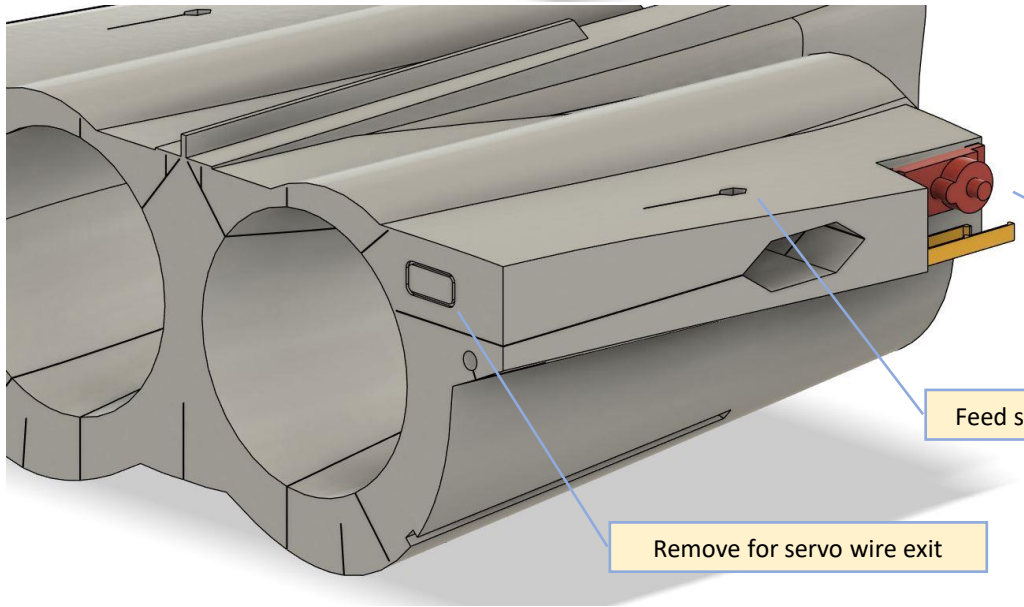
CUT OUT - only UPPER section
and the small support behind



ElevCoverHolderL

- ~~LW-PLA~~ - Recommend PLA+
- Print: 3 wall, 3 Base, 3 Top, 100% Infill

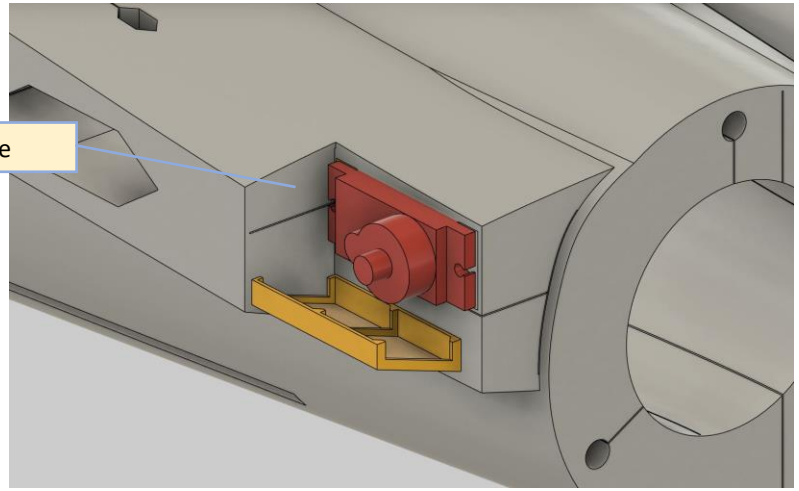
Mirror & print any "L" parts
for RIGHT elevon



Servo screwed in place

Feed servo wires through inside

Remove for servo wire exit



Elevons

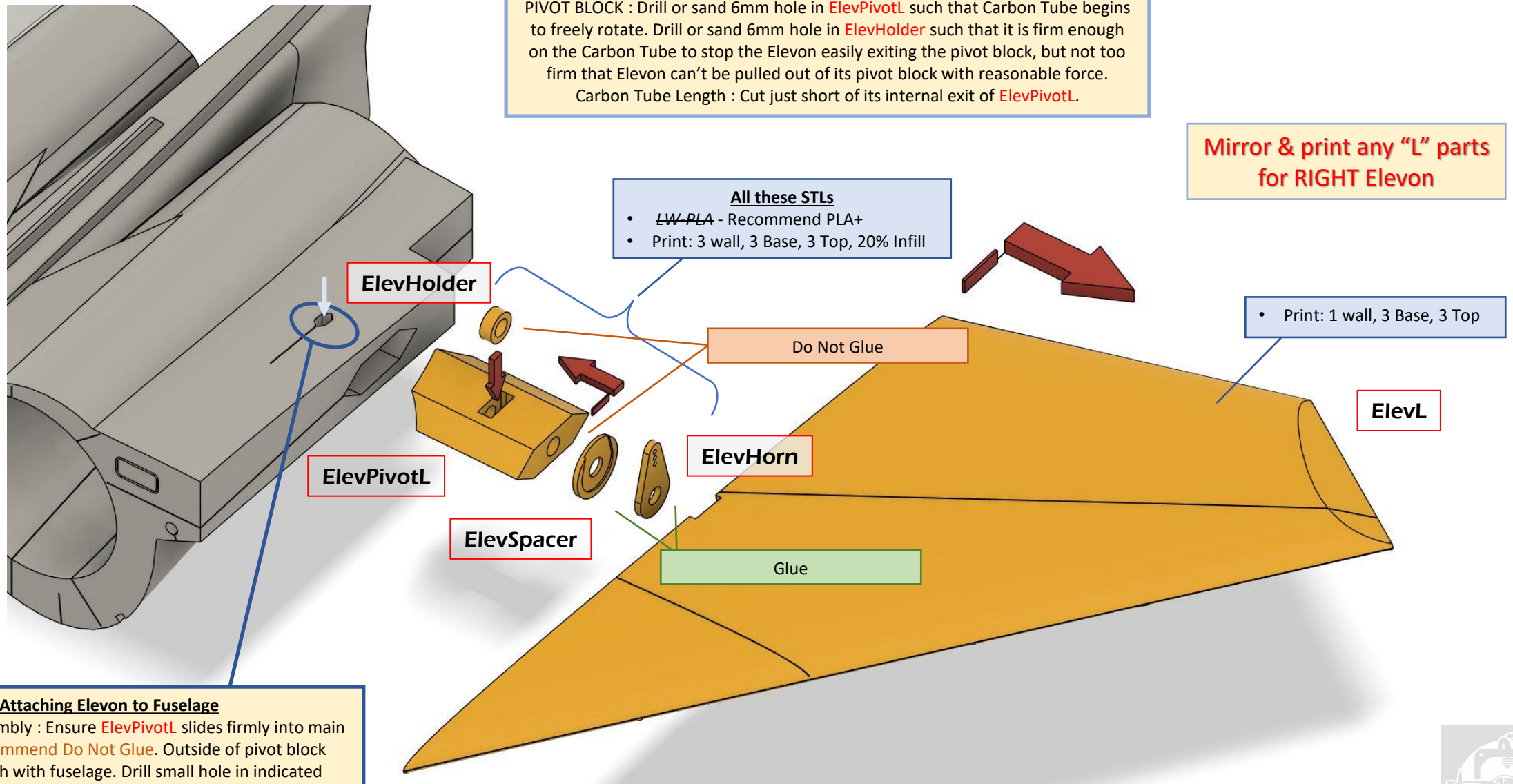
Elevon Arrangments

CARBON TUBE : (6mm) Glue Carbon Tube to ElevL and ElevHorn only at where these 3 pieces interface. Then glue ElevSpacer to ElevHorn.

PIVOT BLOCK : Drill or sand 6mm hole in ElevPivotL such that Carbon Tube begins to freely rotate. Drill or sand 6mm hole in ElevHolder such that it is firm enough on the Carbon Tube to stop the Elevon easily exiting the pivot block, but not too firm that Elevon can't be pulled out of its pivot block with reasonable force.

Carbon Tube Length : Cut just short of its internal exit of ElevPivotL.

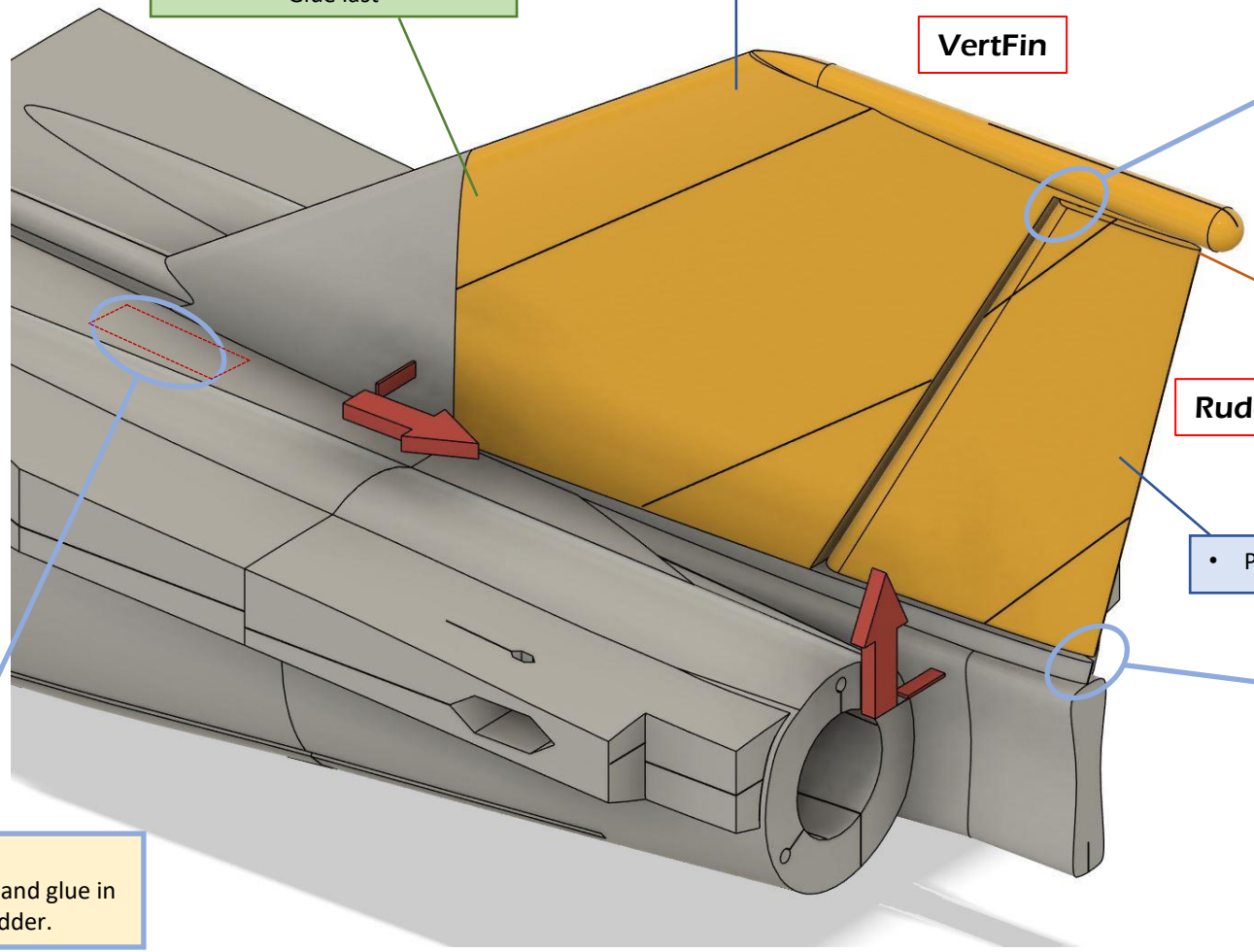
Mirror & print any "L" parts for RIGHT Elevon



Attaching Elevon to Fuselage

During final assembly : Ensure ElevPivotL slides firmly into main fuselage. Recommend Do Not Glue. Outside of pivot block should be flush with fuselage. Drill small hole in indicated location and use small screw to hold pivot block in place

Tail



- Print: 1 wall, 3 Base, 3 Top

Glue last

VertFin

Rudder Pivots
Use Spring Wire (1.6-1.8mm) as upper and lower pivots. Approx 35mm for top, 45mm for bottom.

Do Not Glue

Rudder

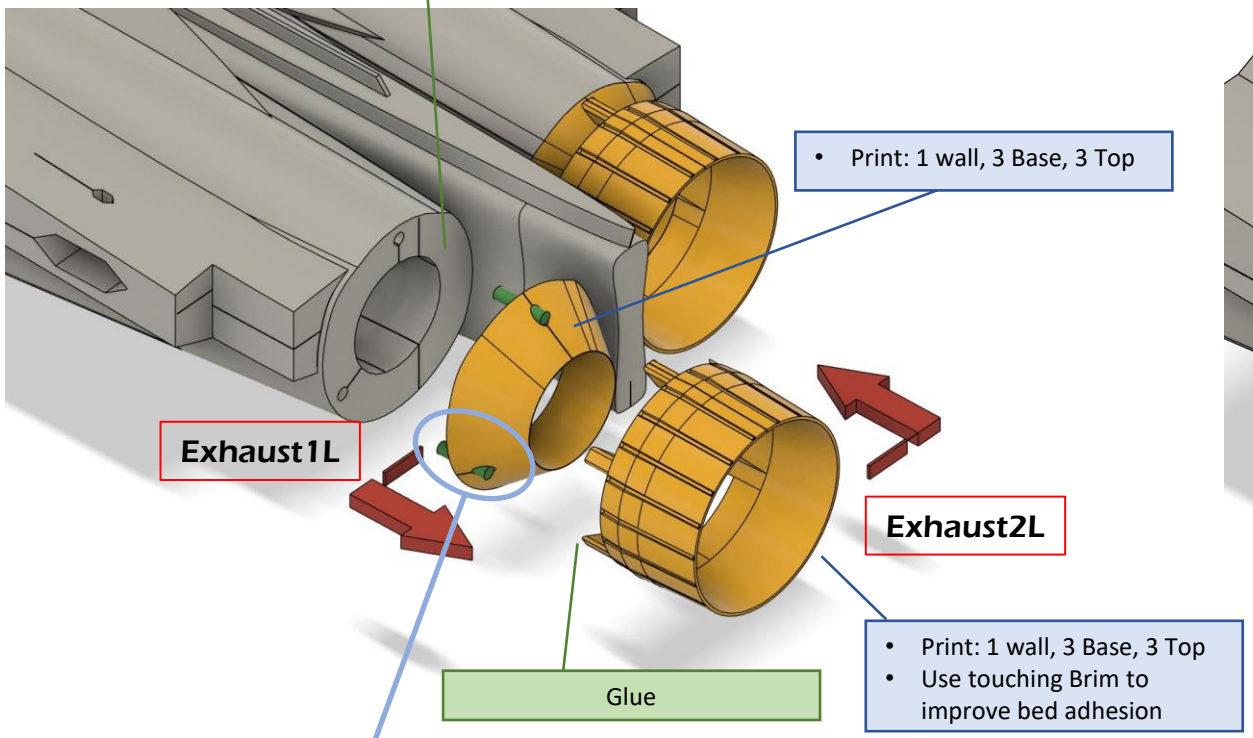
- Print: 1 wall, 3 Base, 3 Top

Rigid Rudder
Use some hot-glue or similar to secure lower aft Rudder to fuselage.

Optional Rudder Servo
Suggested location to cut fuselage and glue in an extra Servo to actuate Rudder.

Exhaust

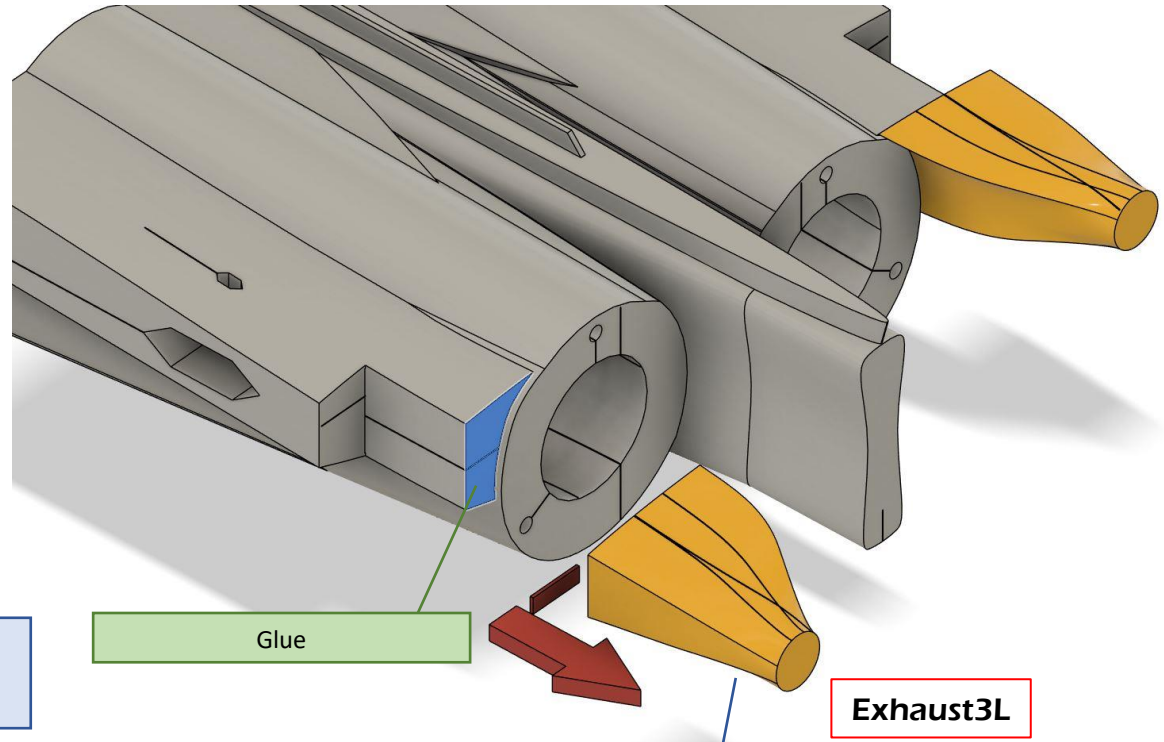
Mirror & print any “L” parts for RIGHT Exhaust



- Print: 1 wall, 3 Base, 3 Top

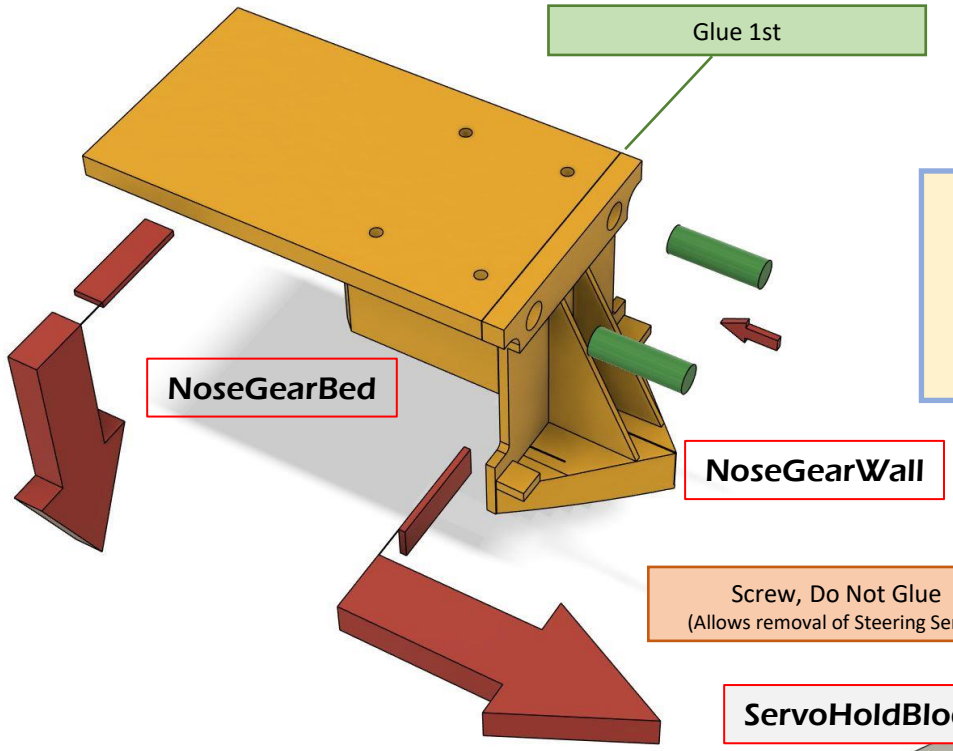
- Print: 1 wall, 3 Base, 3 Top
- Use touching Brim to improve bed adhesion

Locator Dowels
As shown, allow a small amount of the dowels to protrude. With 2 “arms” of Exhaust2L being slightly different, this allows it via the dowels to locate correctly onto Exhaust1L.



- Print: 1 wall, 3 Base, 3 Top

Nose Gear



Glue 1st

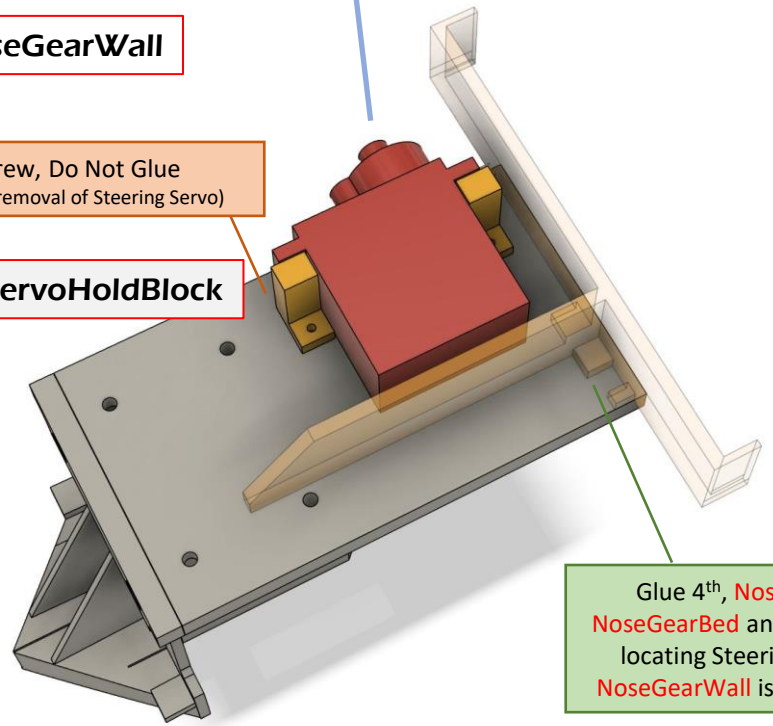
NoseGearBed

NoseGearWall

Steering Servo
Before gluing Nose Gear assembly into fuselage, mount Steering Servo on the correct side for your Nose Retract (Mirror NoseBedBrace if reverse to shown). Ensure Servo mounting does not interfere with correct location of NoseBedBrace.

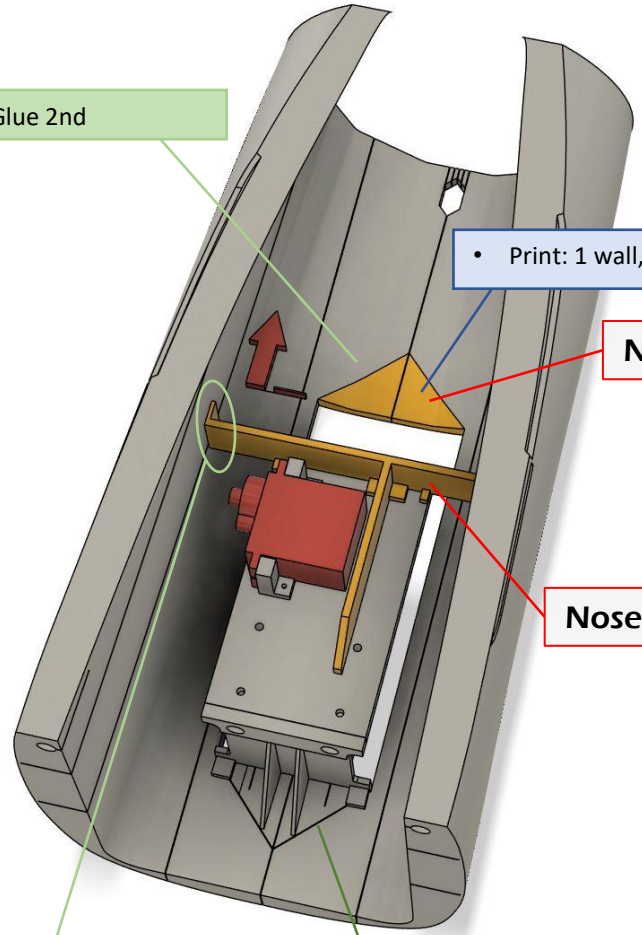
Screw, Do Not Glue
(Allows removal of Steering Servo)

ServoHoldBlock



All these STLs
- ~~LW-PLA~~ - Recommend PLA+
- Print: 3 wall, 3 Base, 3 Top, 20% Infill

Glue 2nd



- Print: 1 wall, 3 Base, 3 Top

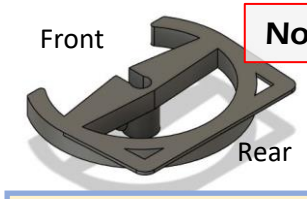
NoseWedge

NoseBedBrace

Glue 3rd

Glue 4th, NoseBedBrace onto NoseGearBed and fuselage only after locating Steering Servo first and NoseGearWall is glued into Fuselage

Nose Gear

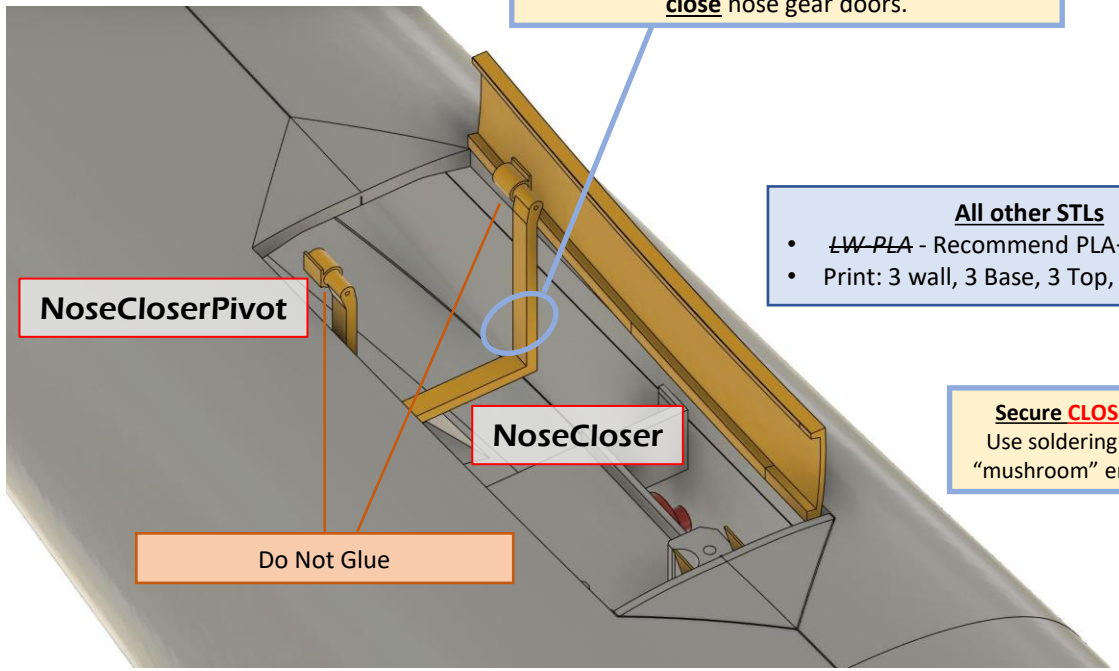


NoseGearGuide

Use screw to attach NoseGearGuide to 3mm gear wire. Should be aligned to lowest portion of door when open

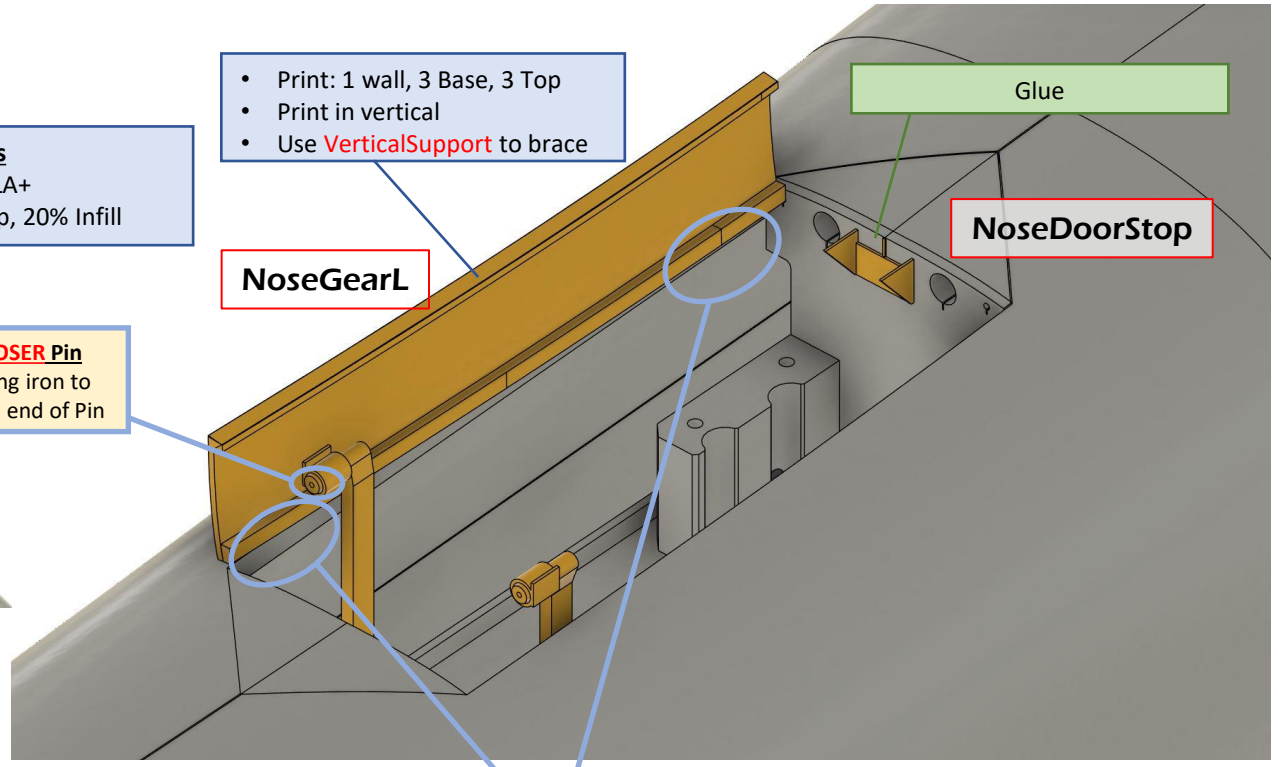
Mirror & print any "L" parts for RIGHT Door

Nose Door Open & Close
Use NoseGearGuide attached to Retract Leg to push **open** nose gear doors.
Use nose wheel(s) pushing on NoseCloser. To **close** nose gear doors.



All other STLs
- ~~LW-PLA~~ - Recommend PLA+
- Print: 3 wall, 3 Base, 3 Top, 20% Infill

- Print: 1 wall, 3 Base, 3 Top
- Print in vertical
- Use VerticalSupport to brace



Secure CLOSER Pin
Use soldering iron to "mushroom" end of Pin

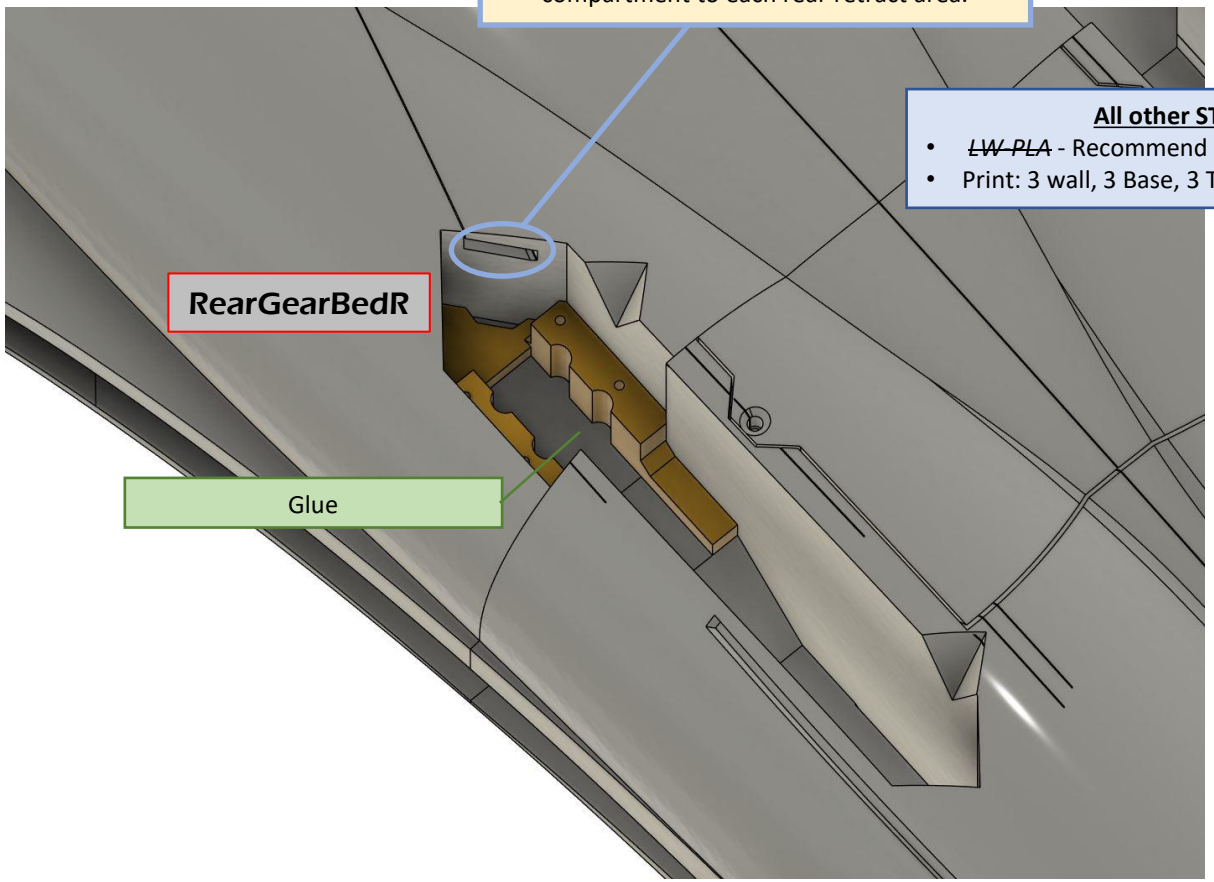
Gear Door Actuation
The next few pages provide a Undercarriage Door opening and closing solution using only the (low) mechanical "push" energy of the 25gram retracts themselves. This can be difficult to get working and may not be 100% reliable. If you intend to use 6S power and an RX with enough channels, consider using micro-servos to actuate the doors instead.
Suggest at least start with the Nose Gear Doors as they tend to be the more difficult to set up.

Nose Door Hinges
Use 2x Dubro type hinges in each door. Use a scalpel to cut slots into **hollow centre** of fuselage and **hollow centre** of NoseGearL. Push hinge with a small amount of glue into slots.

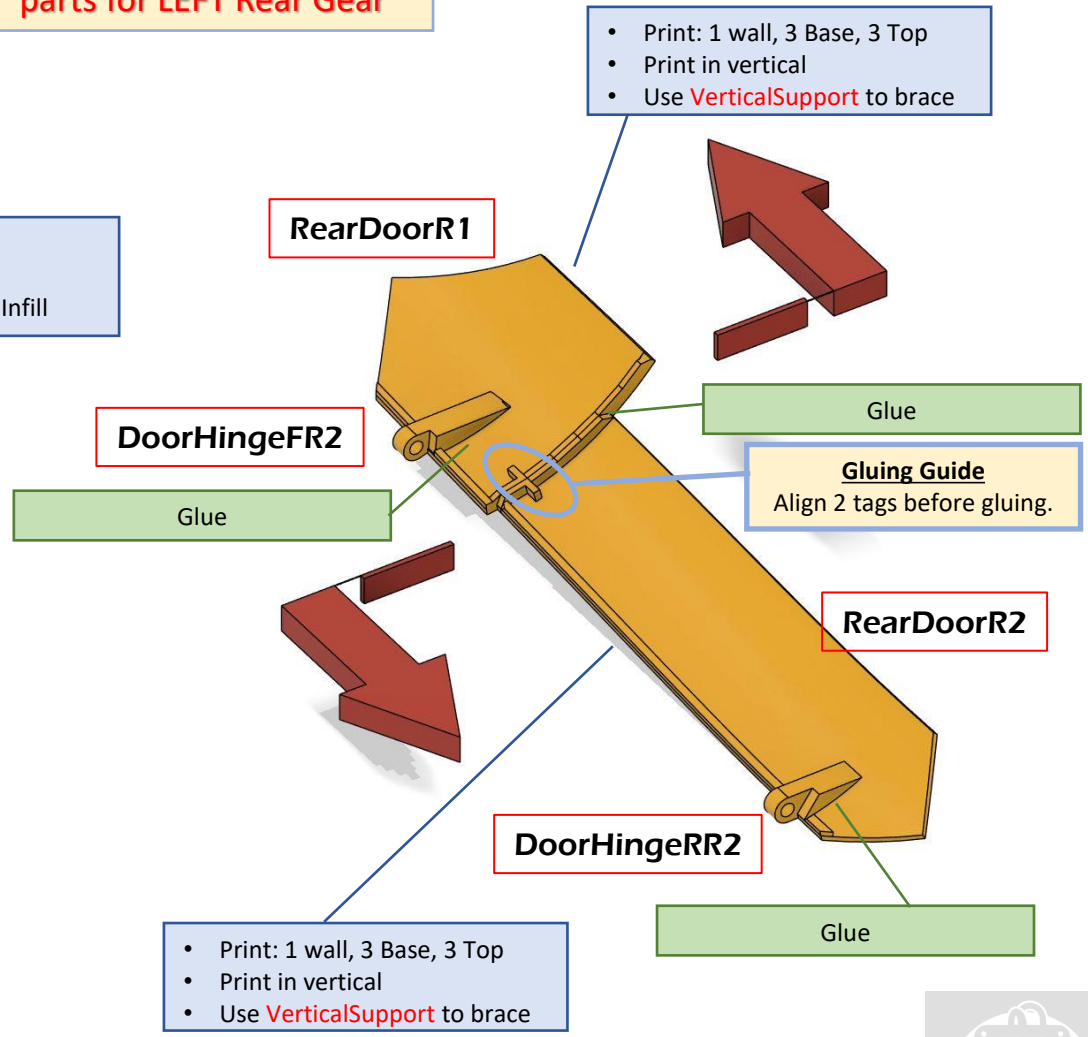
Rear Gear

Electric Retract Wire Exit
Run servo wire extensions from front compartment to each rear retract area.

All other STLs
- ~~*LW-PLA*~~ - Recommend PLA+
- Print: 3 wall, 3 Base, 3 Top, 20% Infill



Mirror & print any "R" parts for LEFT Rear Gear



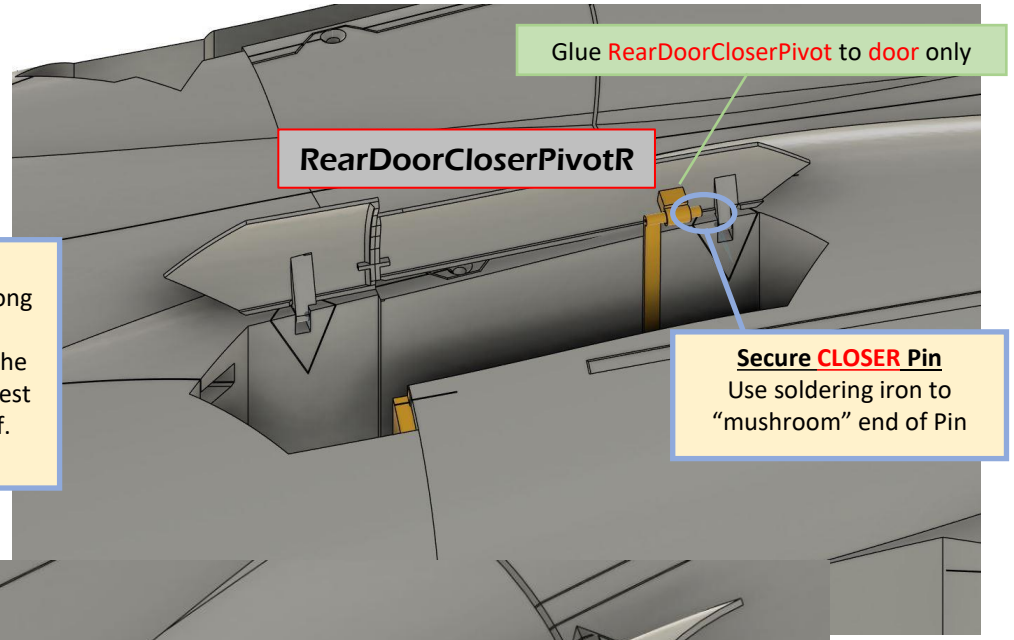
Rear Gear

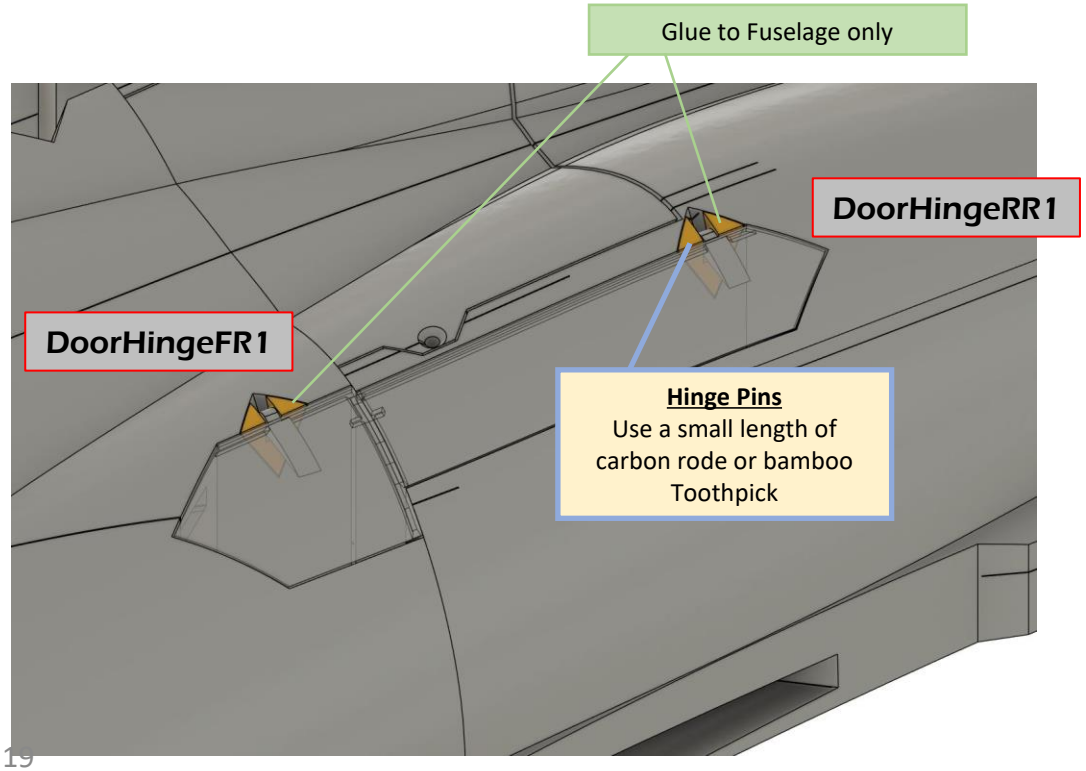
Mirror & print any "R" parts for Left Rear Gear

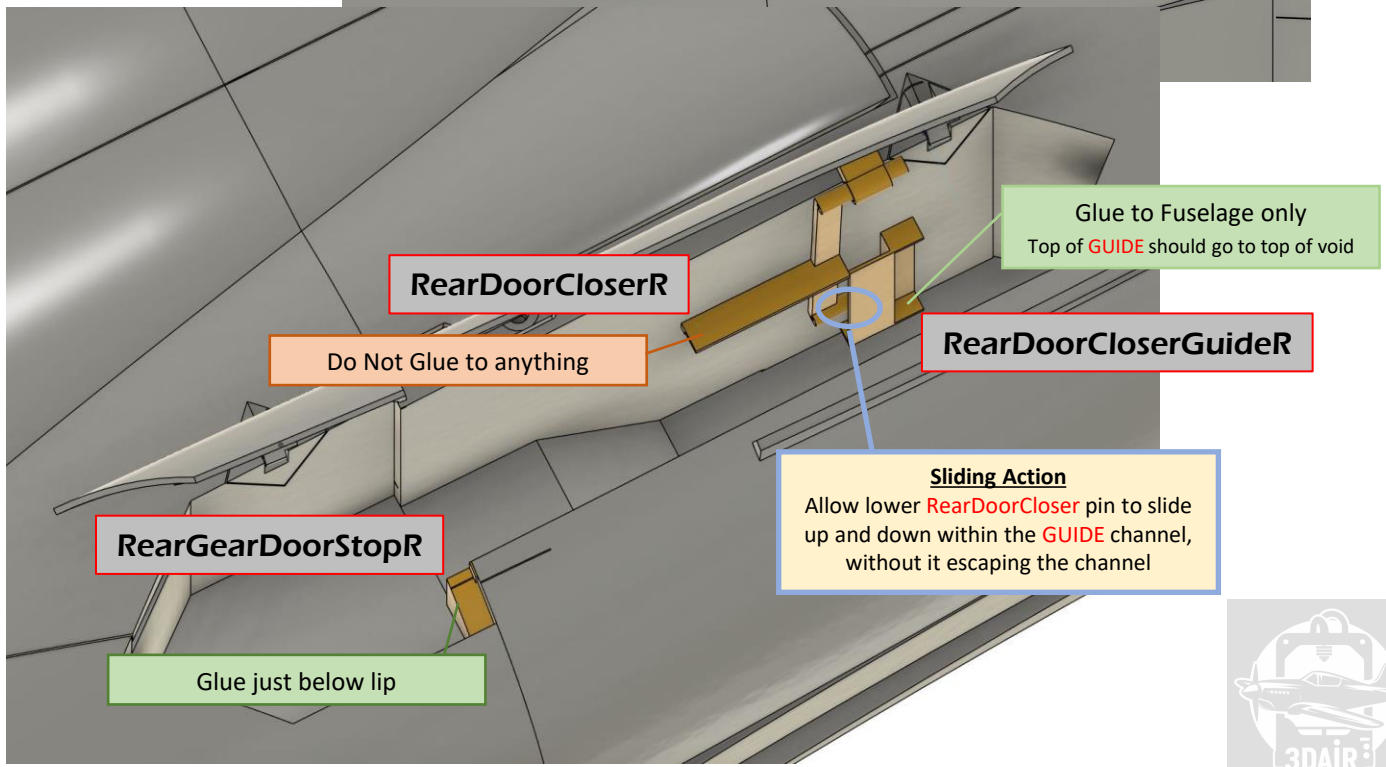
How does it work?
OPENING: The rear retract wheel initially pushes the doors open. The retract Spring Wire holds the doors open.
CLOSING: The retract Spring Wire pushing on RearDoorCloser to push the doors closed.

All these STLs
- ~~*LW PLA*~~ - Recommend PLA+
- Print: 3 wall, 3 Base, 3 Top, 20% Infill

Rear Gear Door Open/Closer Arrangments
Overall CLOSER arrangement can be positioned anywhere along the length of the rear gear wheel enclosure, but the best position is lining the horizontal Tab of RearDoorCloser with the lowest portion of the retracts Spring Wire, but allowing the rest of the CLOSER hardware to not tangle with the Wheel itself. RearGearWire provides the Spring Wire template.



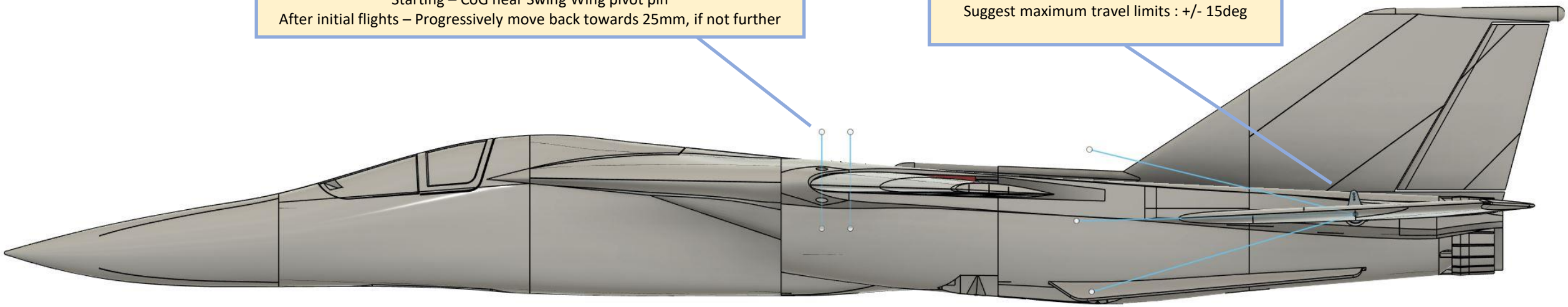




Flight Setup

CoG
With wings swept full forward / trailing edge of wing near perpendicular :
Starting – CoG near Swing Wing pivot pin
After initial flights – Progressively move back towards 25mm, if not further

Elevons
Neutral position : Line leading edge point up with bottom ledge of the flat fuselage area.
Suggest maximum travel limits : +/- 15deg

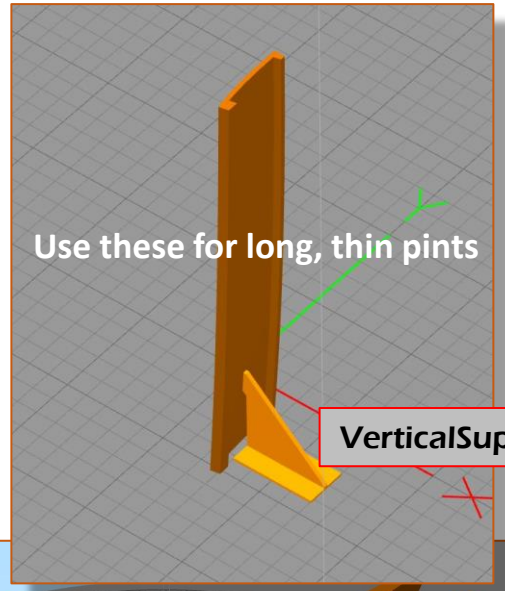


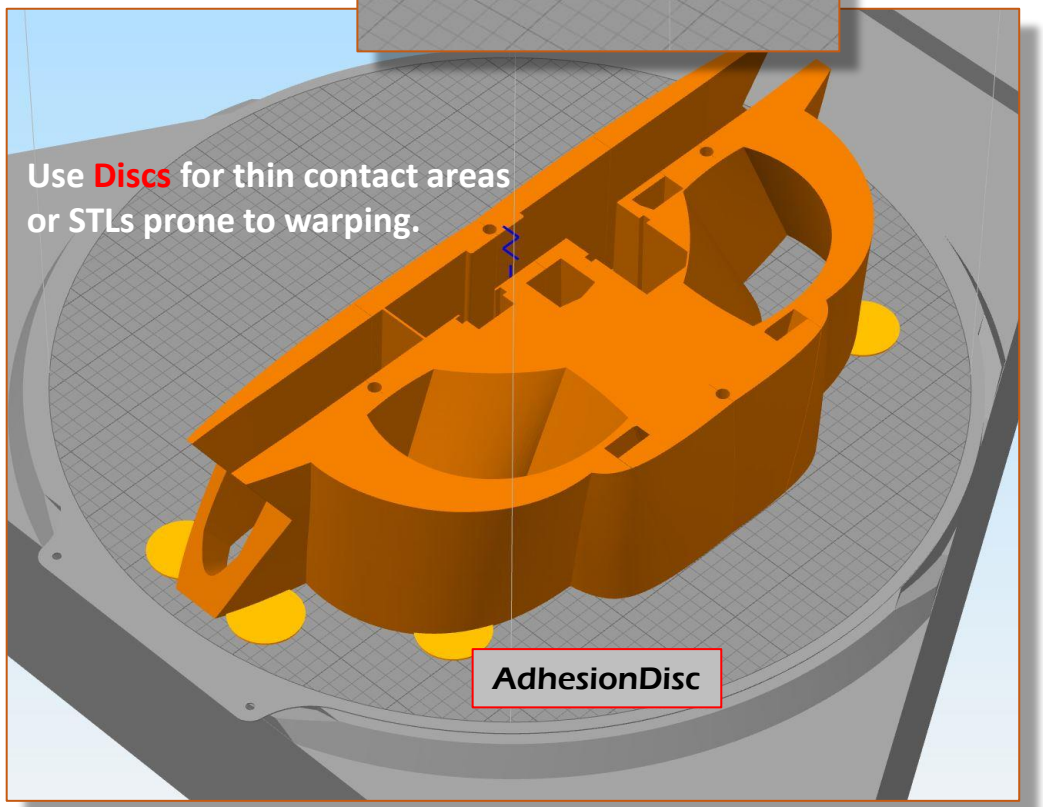
Swing Wing Considerations

Not a lot of test time was spent with the wing swept, but these elements should be considered;

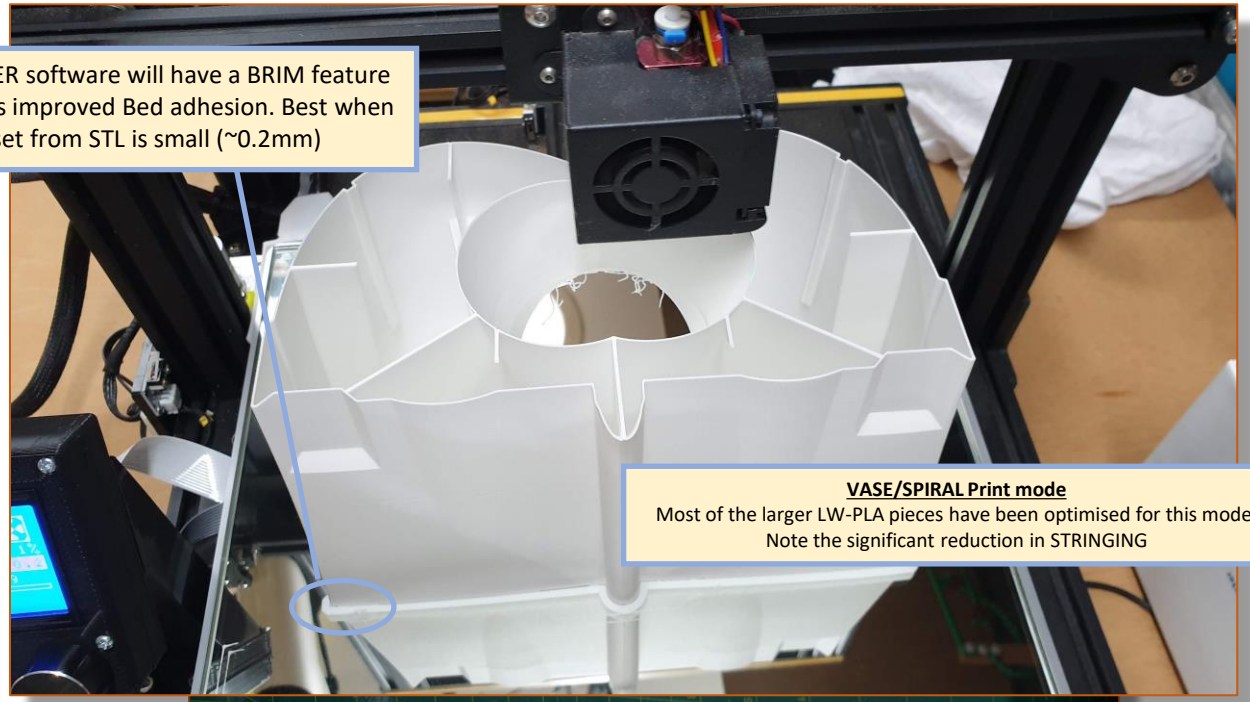
- Recommend don't start playing with Swept Wings in your first flights!
- Un-Swept : Use a few flights to get comfortable with the right CoG
- As the wings are swept, the Centre of Lift moves rearward / model acts Nose-Heavy
- More Up-Elevator needs to be added. Try use your TX setup to do this automatically
- The Roll-Rate increase. Try use your TX setup to reduce roll travel automatically
- Double check that any automatic setup work *TOGETHER* to provide reasonable Elevon travel in any direction
- Depending on your EDF, model speed may not increase all that much (*For the LOOKS ONLY!* :D)
- If you have too much friction in your Swing Servo setup, air resistance may not allow wing to swing forward. If this happens try gaining altitude and do a quick pitch-over to remove upward forces on the wing underside
- For obvious reasons trying to landing with wings swept is not recommended

PHOTOS

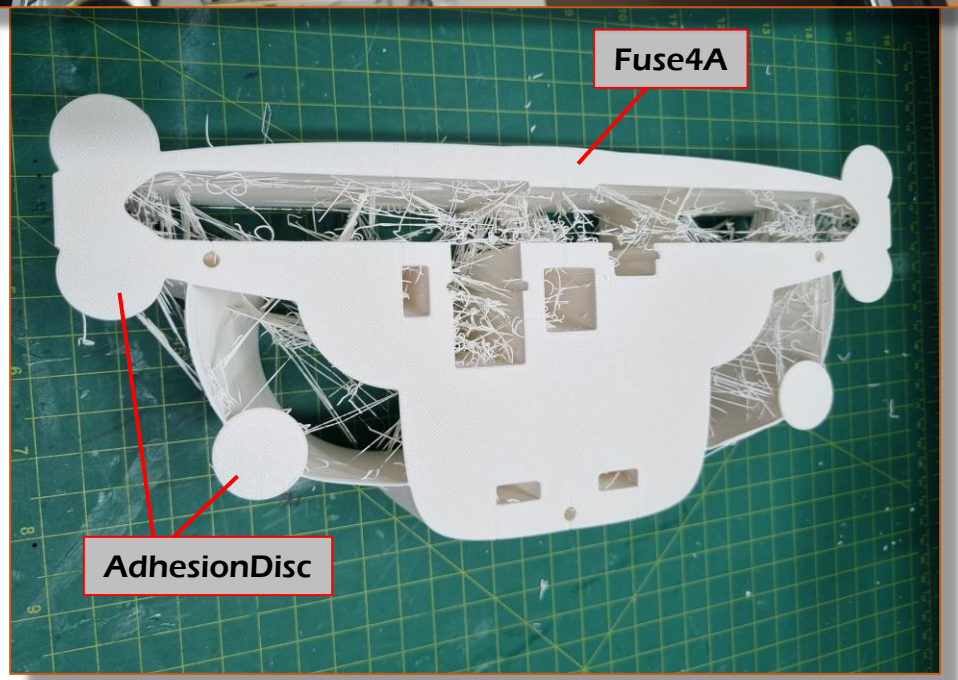


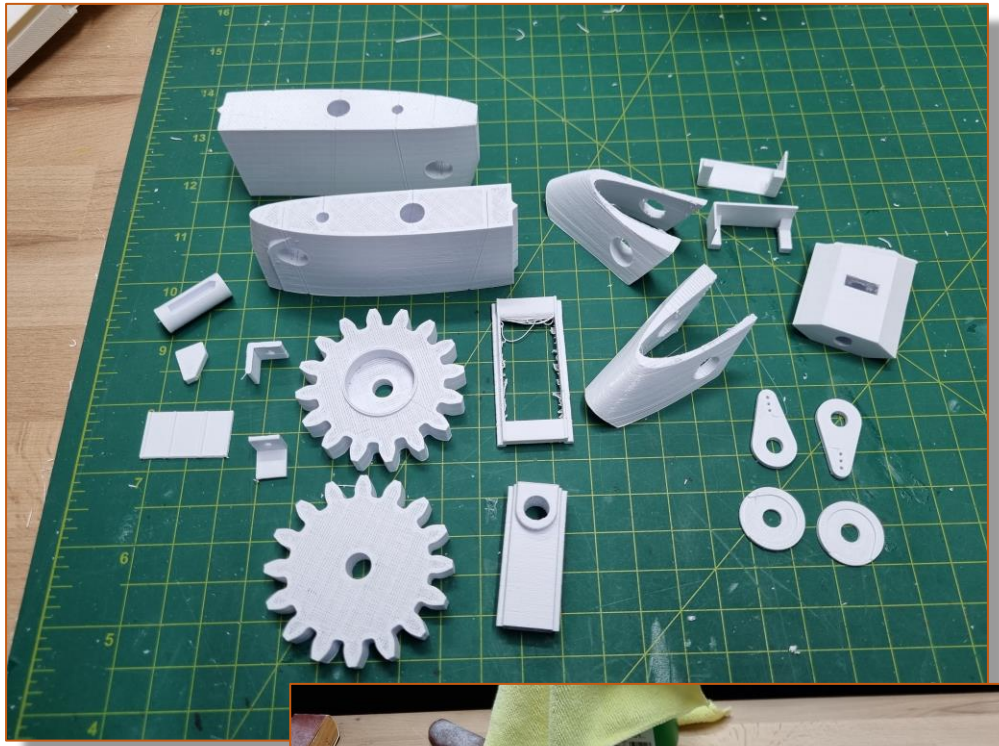


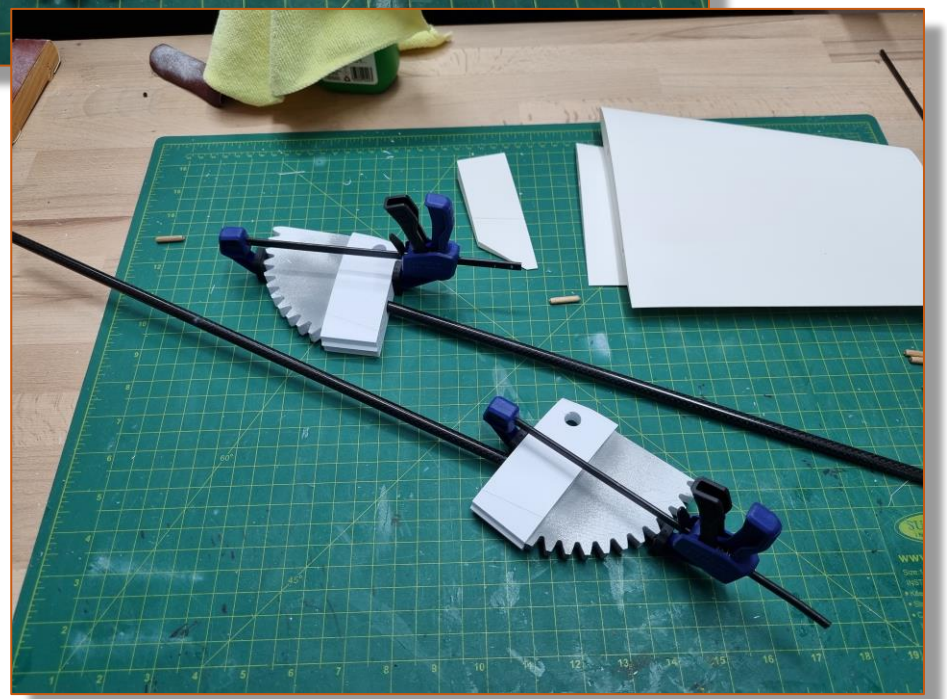
Your SLICER software will have a BRIM feature that allows improved Bed adhesion. Best when offset from STL is small (~0.2mm)



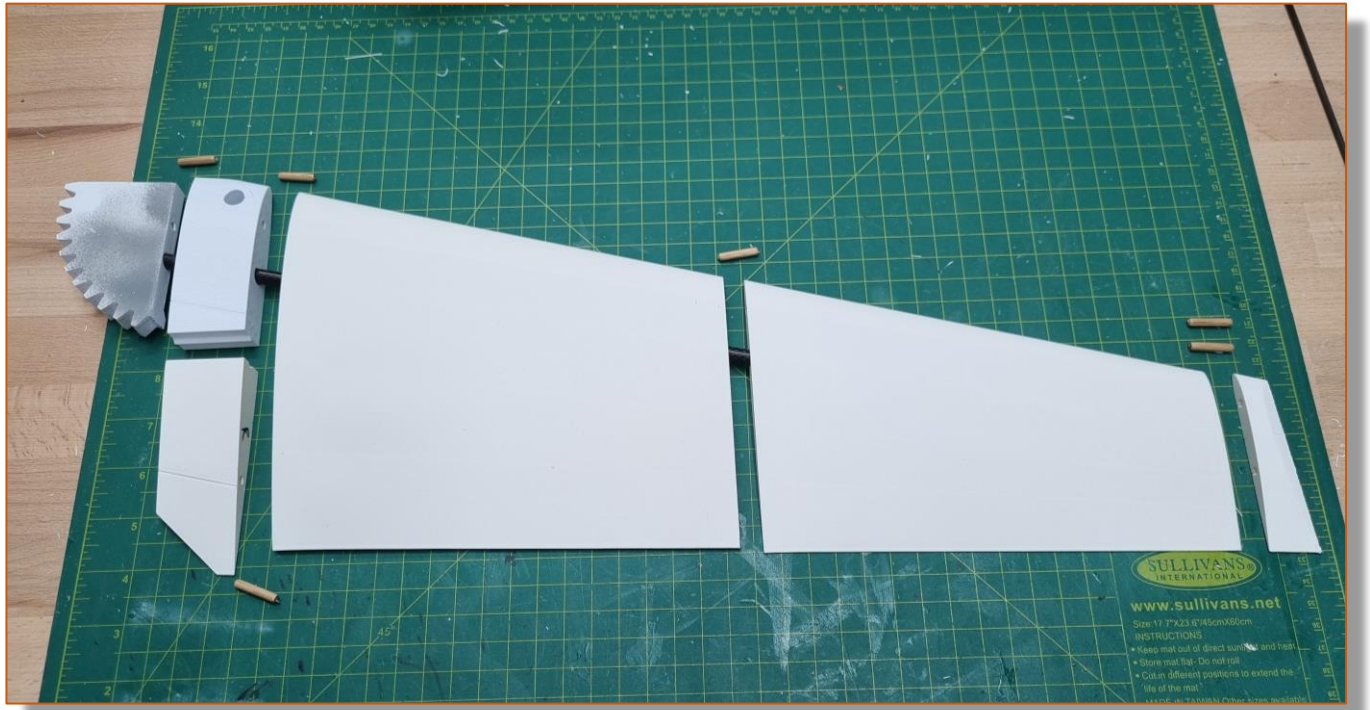
VASE/SPIRAL Print mode
Most of the larger LW-PLA pieces have been optimised for this mode.
Note the significant reduction in STRINGING







Main Swing Wing Pins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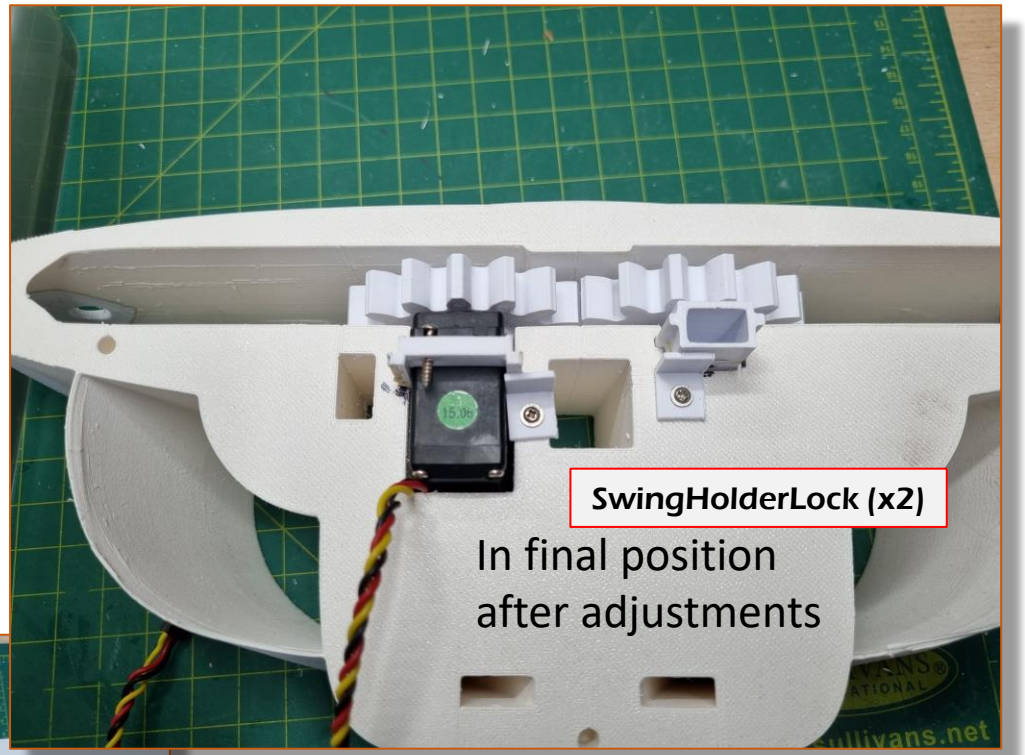
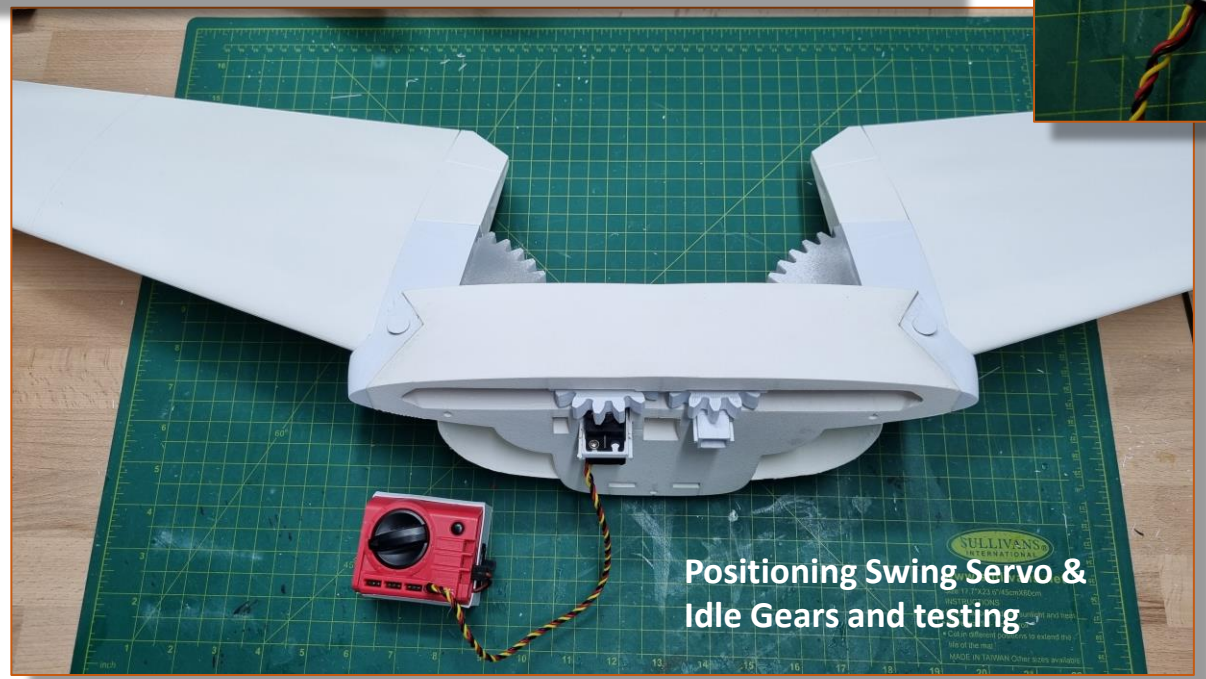
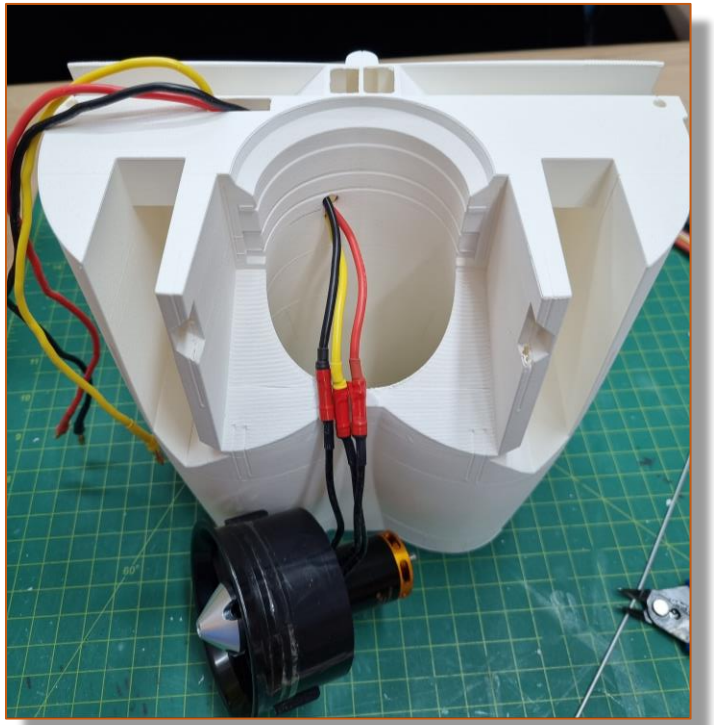
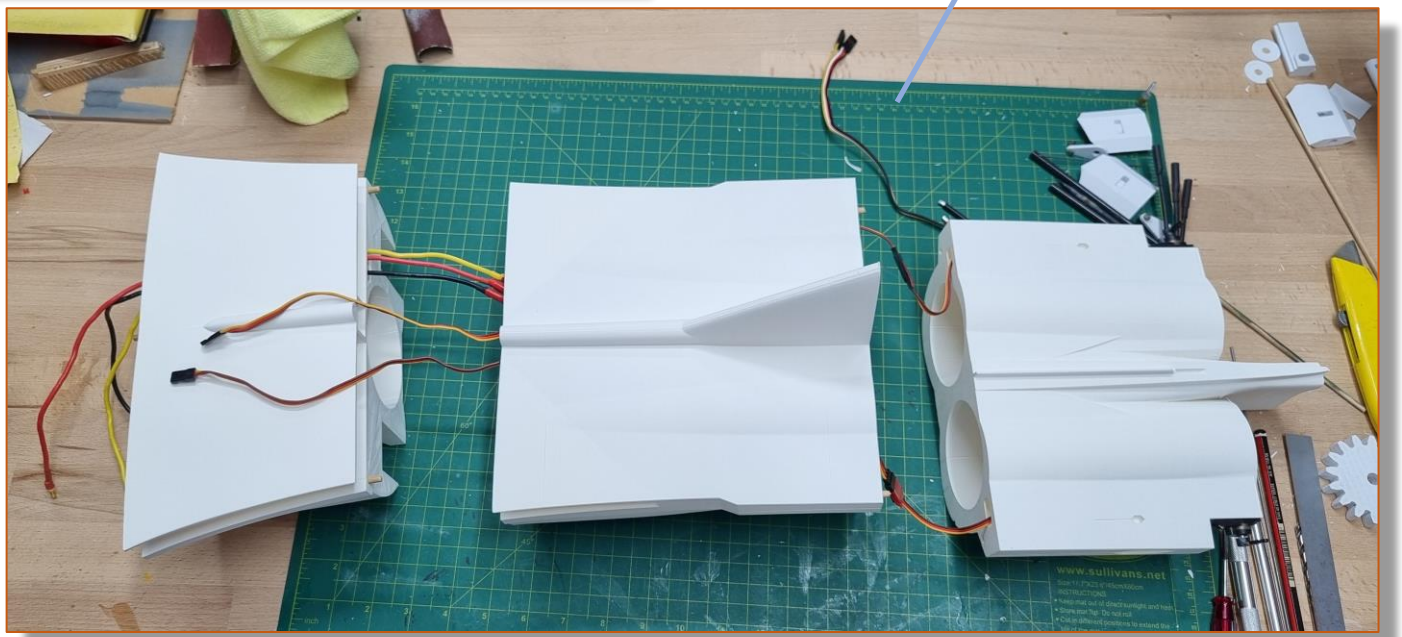

SwingHolderLock (x2)
In final position
after adjustments

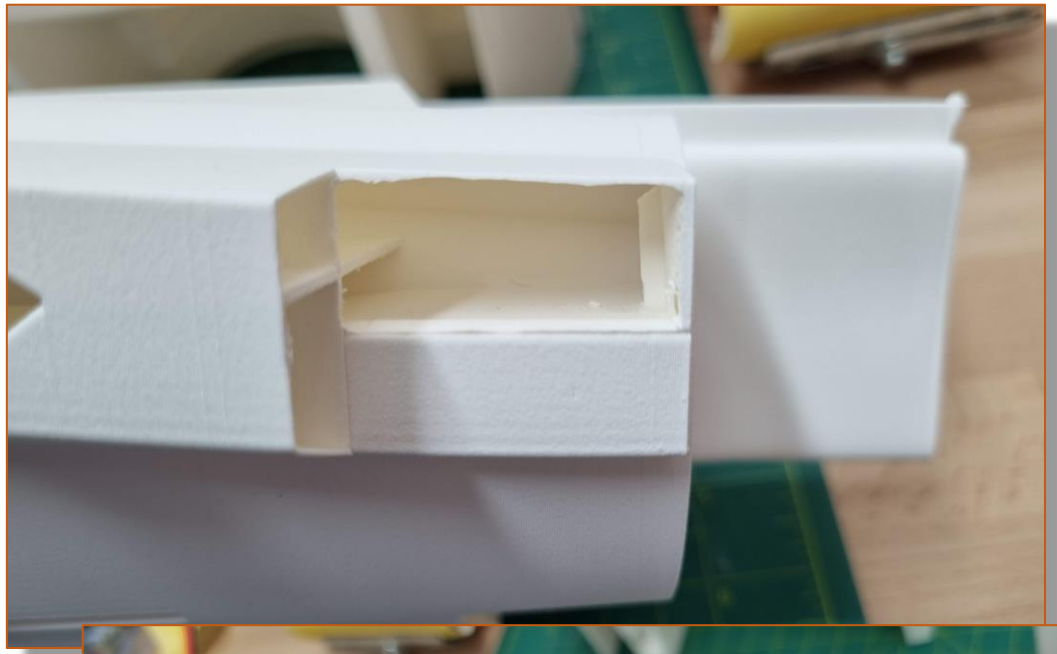

Positioning Swing Servo &
Idle Gears and testing

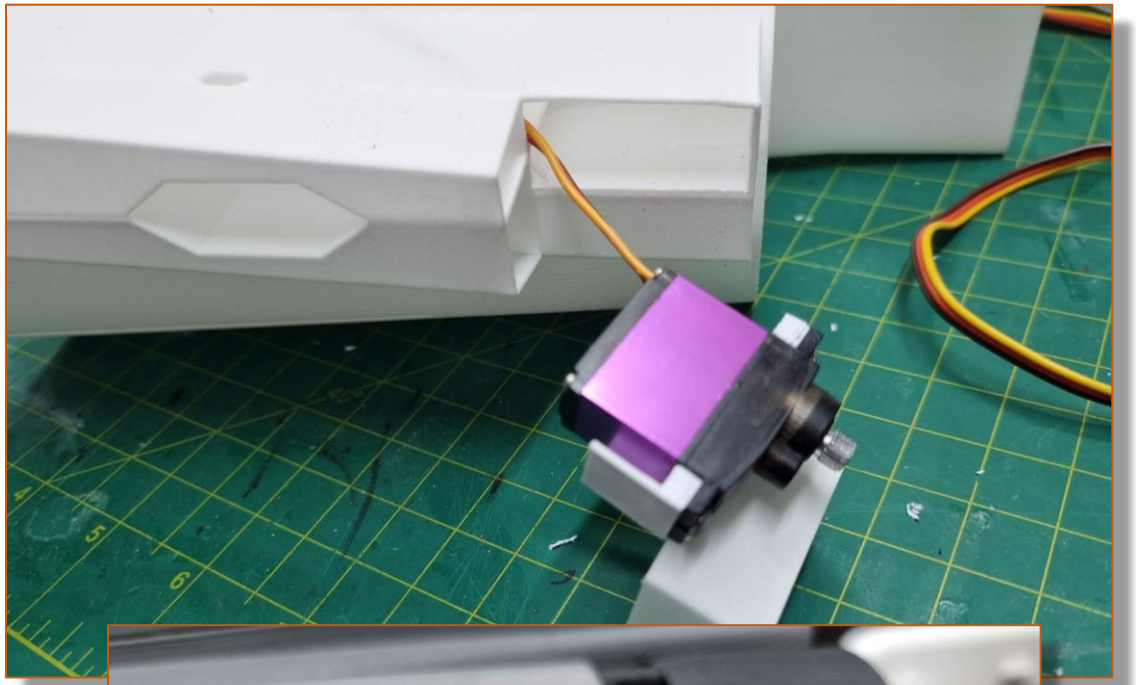
Using a soldering Iron, cut holes just rearward of the fan EDF structure, only just large enough to first Feed the motor leads, then hold the motor leads

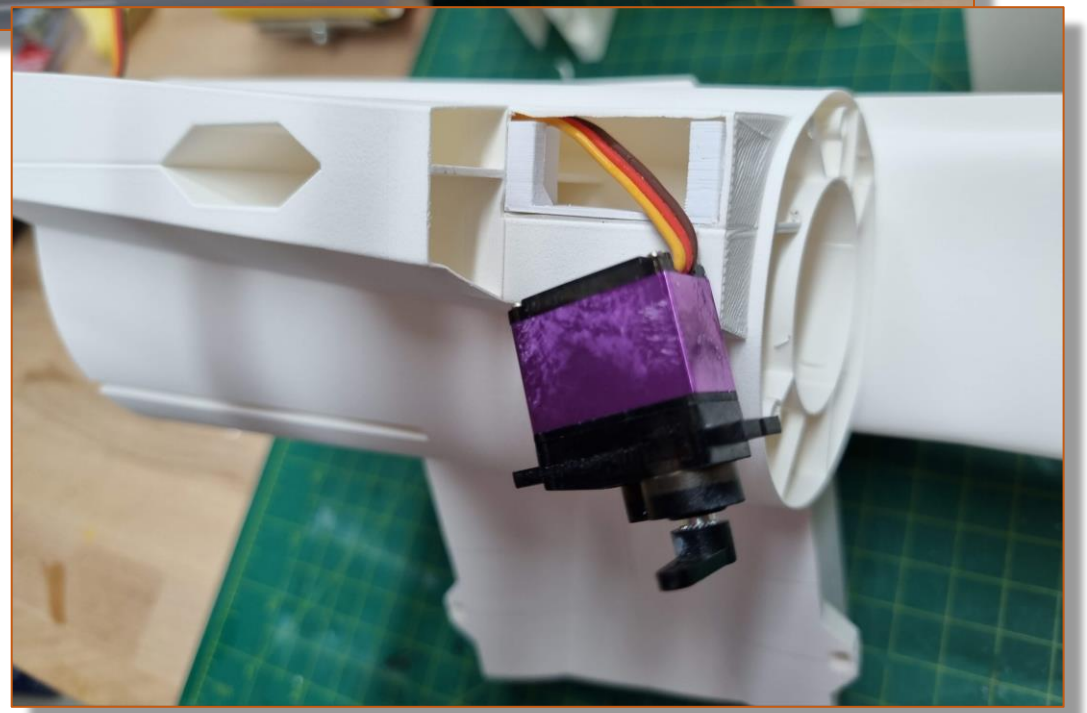


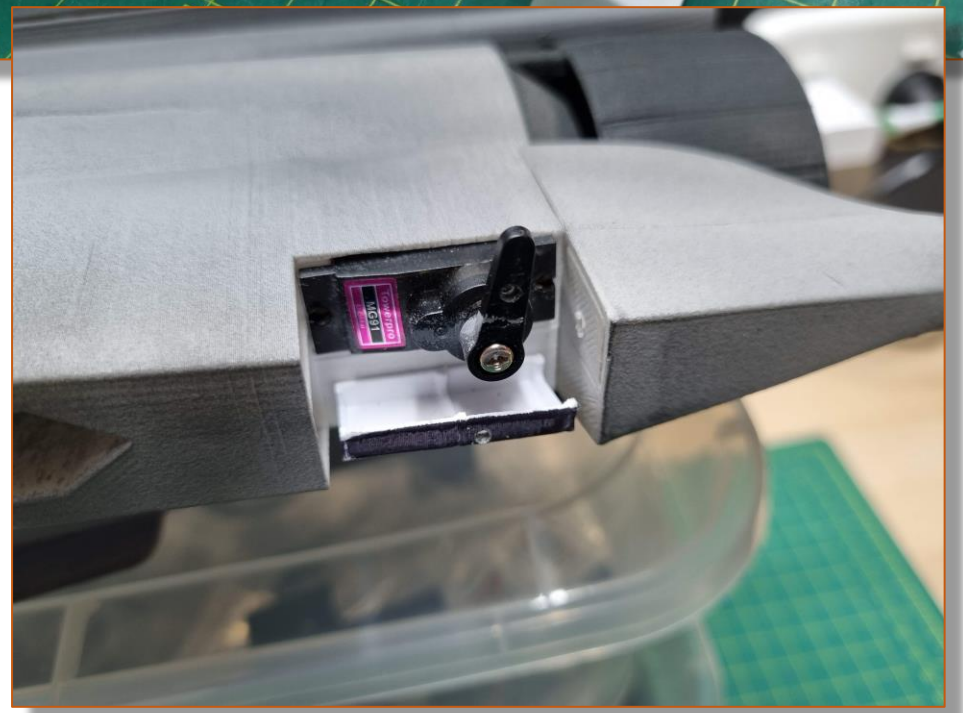
Mount Elevon servos, add extension leads and install EDF unit with motor leads before gluing Fuse6, Fuse5, Fuse4B & Fuse4A together

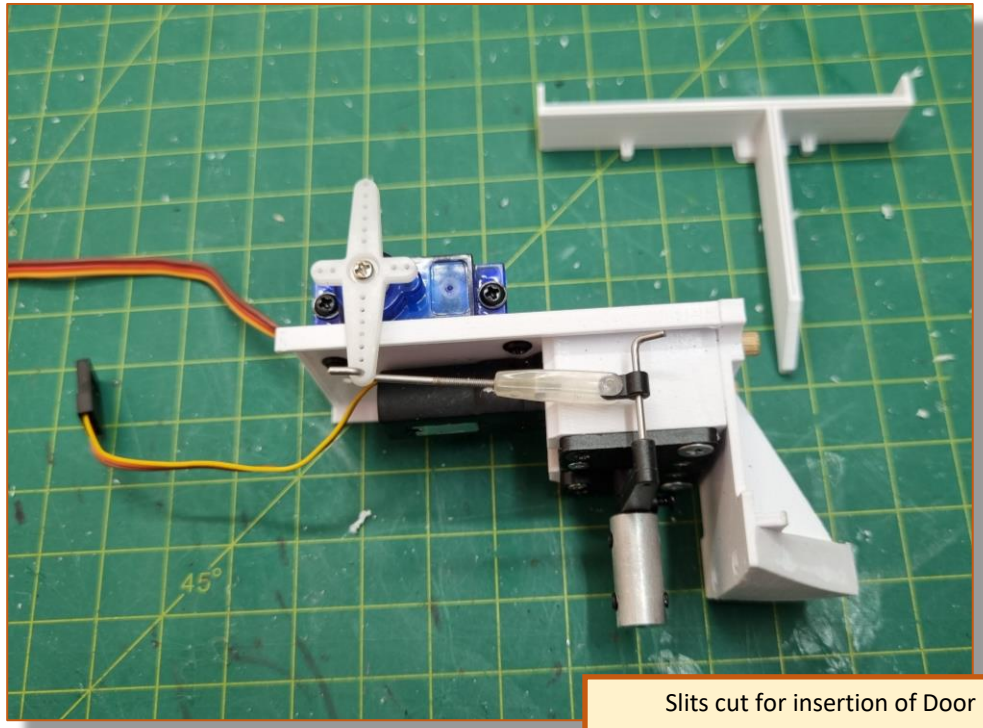


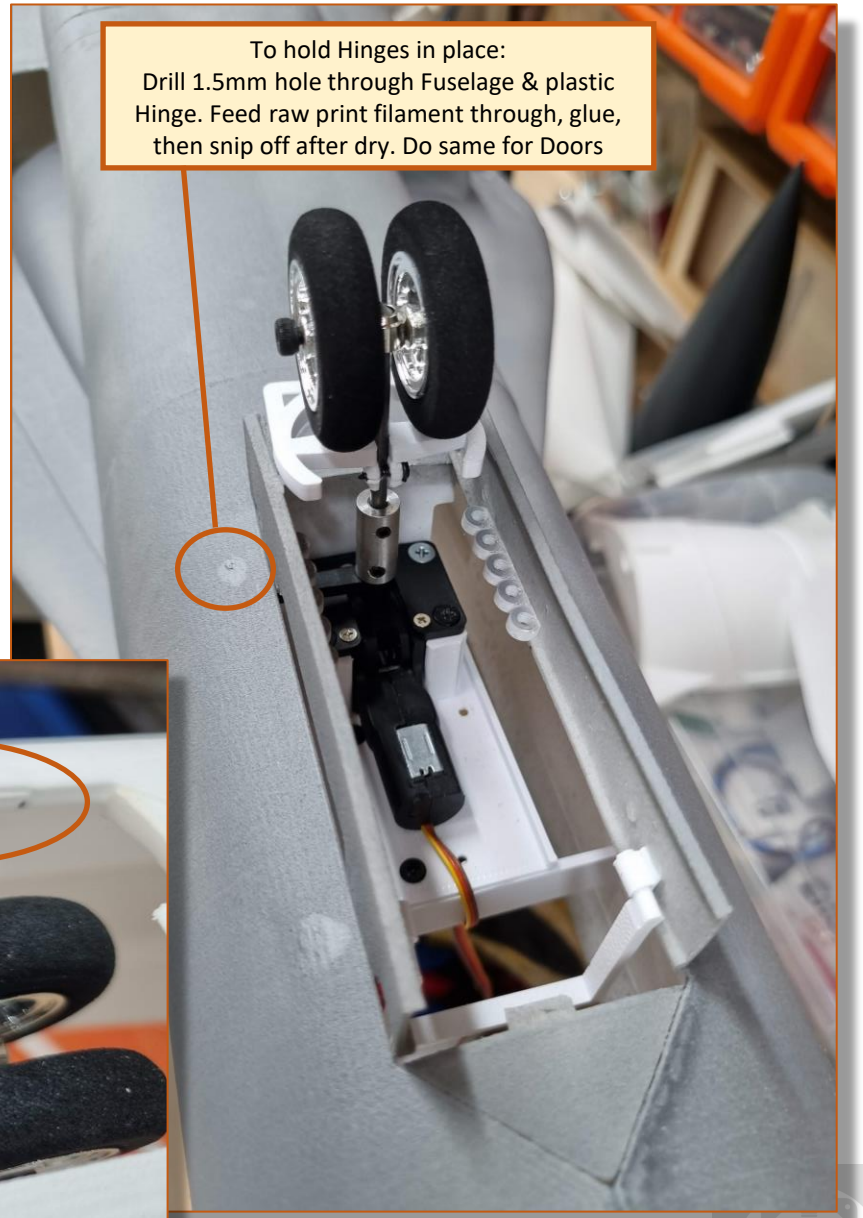






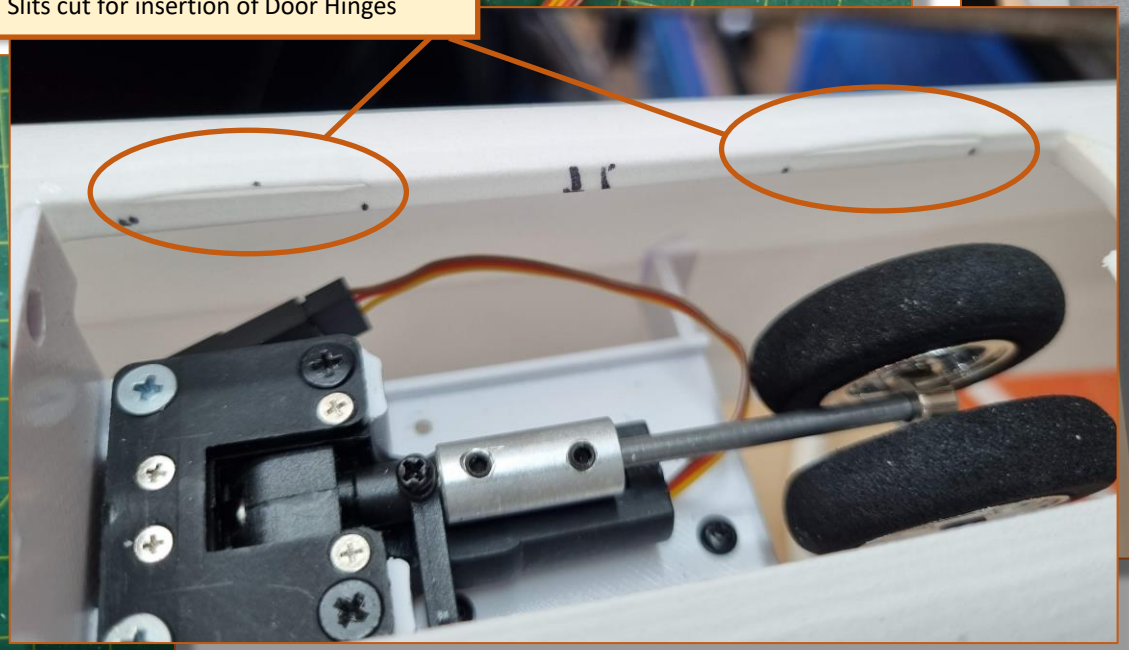




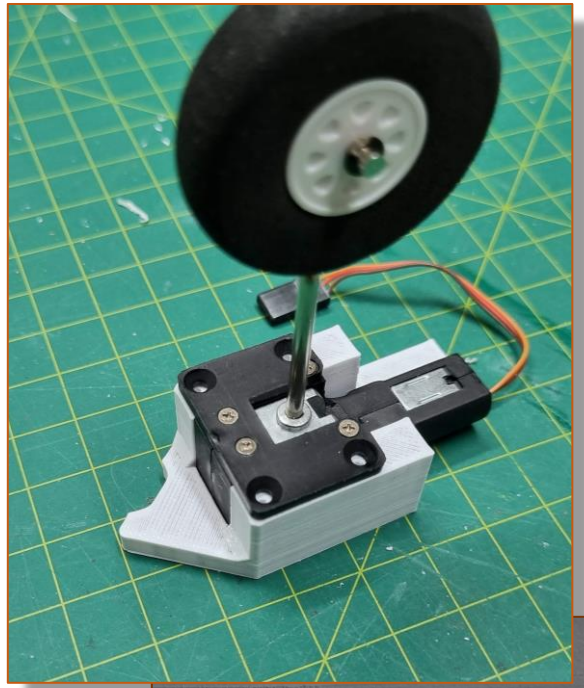


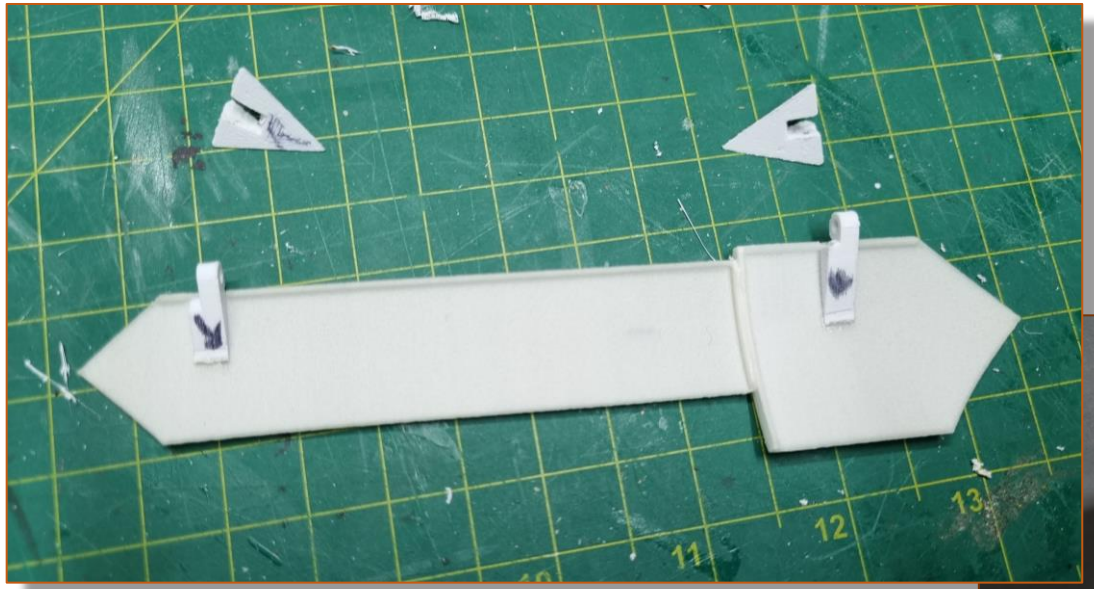
To hold Hinges in place:
Drill 1.5mm hole through Fuselage & plastic Hinge. Feed raw print filament through, glue, then snip off after dry. Do same for Doors

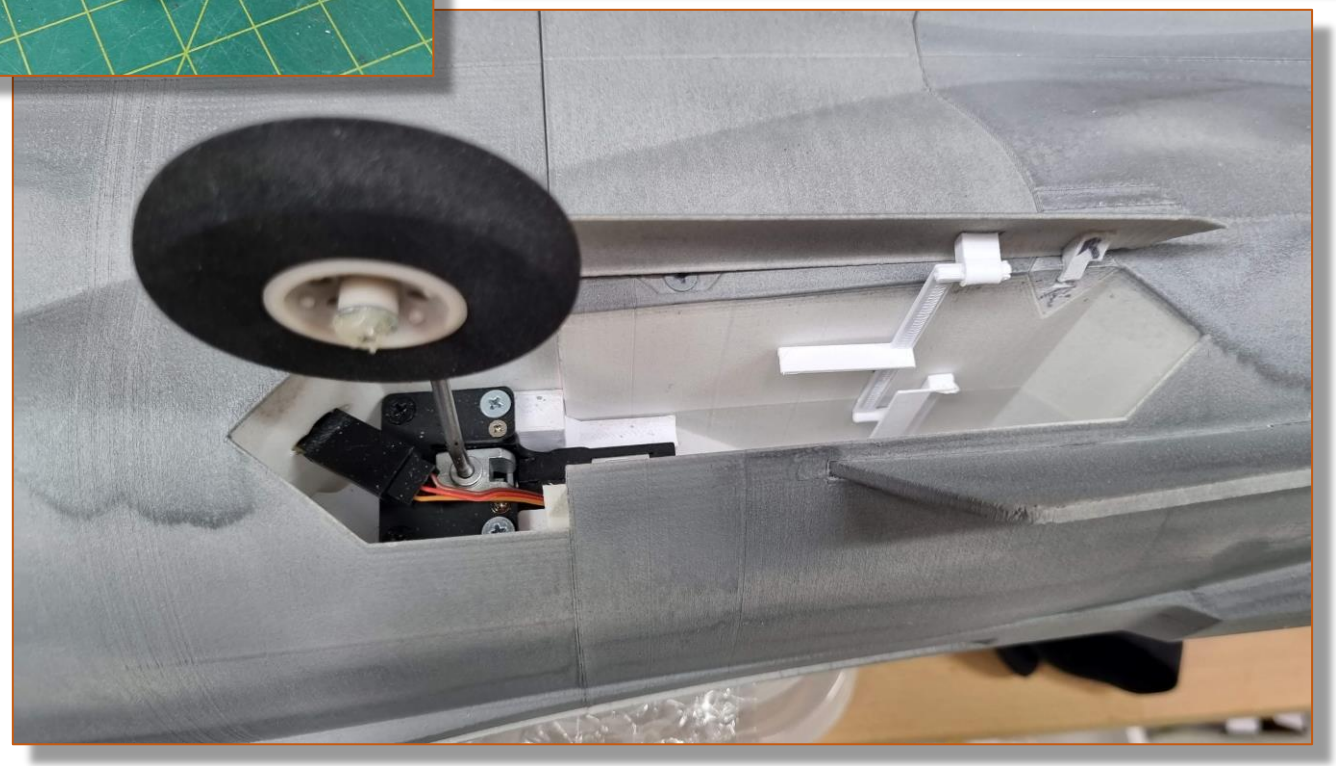
Slits cut for insertion of Door Hinges

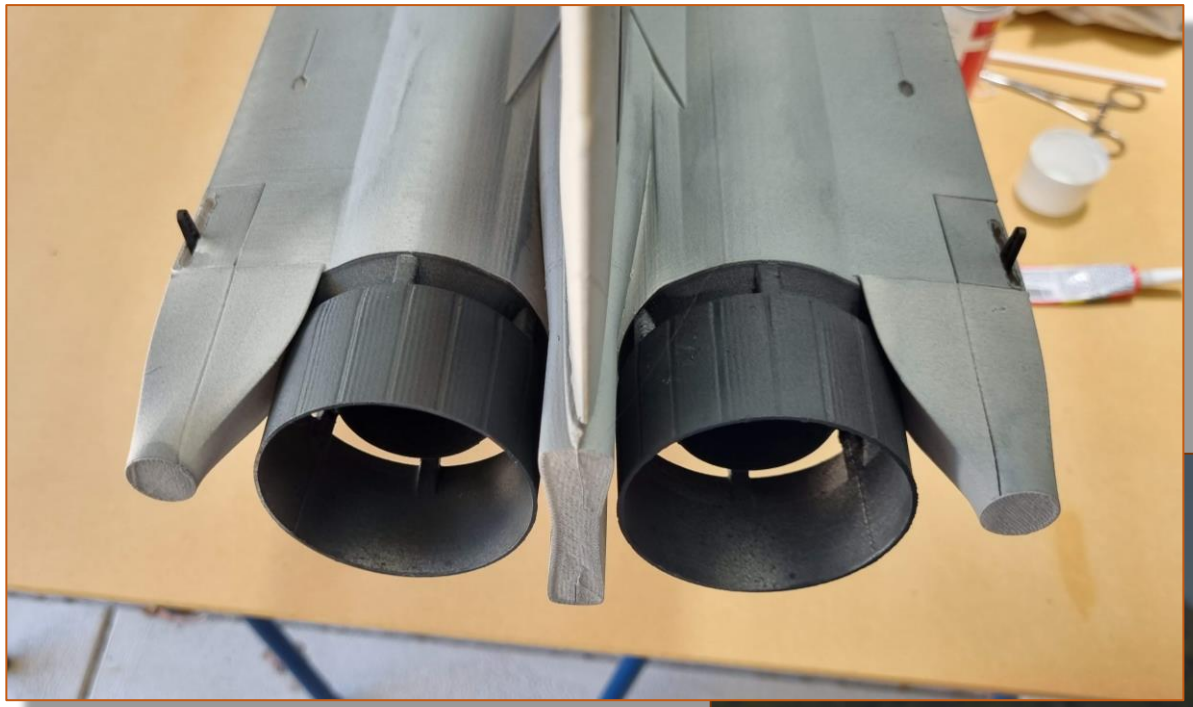


Double screwed Collar used to make nose wheel










MrWaz11 - YouTube