



# PRO FLIGHT TRAINER



Aside from the flight control parts, you will find 2 bags of parts:

In the bigger bag:

M5x18 socket cap screws (10) (+2 serial 24Jxxxx onwards)



M5x35 socket cap screws (2)



M4x12 socket cap screws (2)



M5 washers (14)



M5 lock nuts (8)



M4 Lock nuts (2)



Haribo bears



Fold Stopper V1 (left - red or black) or V2 (right)



Mini-Wrench Nr 13 for quick friction adjustment (red or black)



Nr 3 key and Nr 4 Key



Combo-Wrench Nr 7/8



Calibration wire, used for maintenance and special tasks



Small tube of silicon-based grease, used for friction washers and maintenance



## USB Cable



You will also find floor protection pieces, some strap bands and some other useful items.

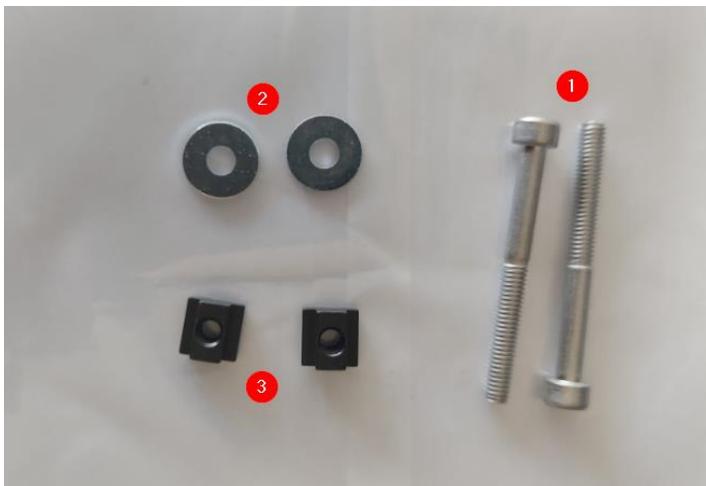
## A-Style Models

In addition, you might also have a small bag of fasteners for the A-Style Cyclic Grip

2x M4 x40mm Socket Cap Screws (1)

2x M4 washers (2)

2x M4 T-Nuts (3)



In the smaller bag (collective bag, don't open yet!)

If you own a serial number XXXCXXX or higher D etc..., your smaller bag content is different -> see page 27.

Note that some hardware might be black or silver.

1. M4x30 standoff (2)
2. Flanged bearing
3. M8 standard washer (2)
4. M8 large washer
5. M8 disc washer (4)
6. Red toggle cover
7. M4 standard washer (4)
8. M8 standard nut
9. M8 lock nut
10. M4 t-nut (4)
11. Collective range limiter

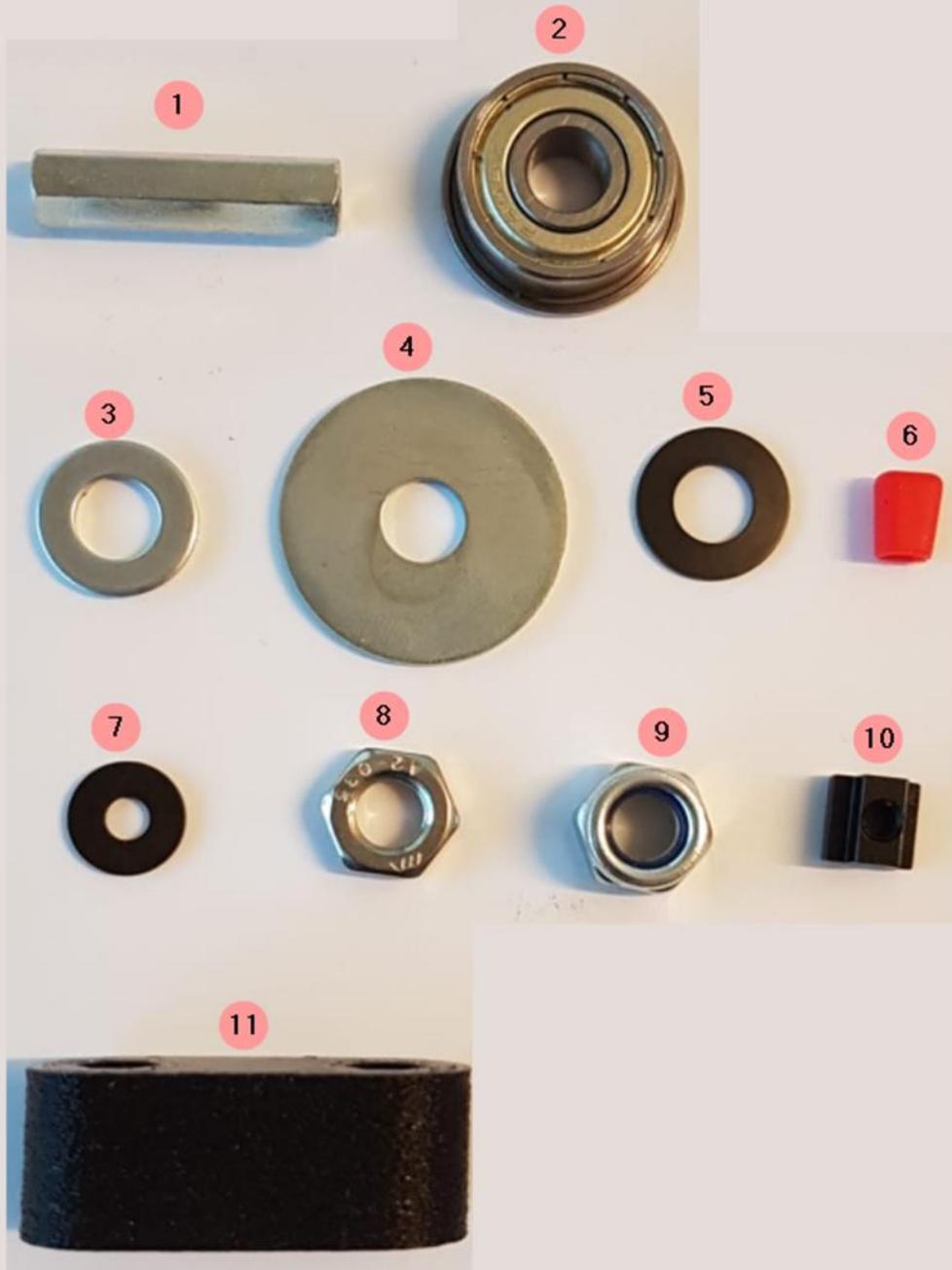
M4x12 socket cap screws (5)

M4x16 socket cap screws (2)

M4x20 socket cap screws (2)



Strap bands and other useful items.



Check if someone is around.

Carefully and quietly open the Haribo bears and count them (High level of noise might attract nearby predators!).

If you have less than 7 bears in the bag, **immediately call our quality control center to report a code red alert!**

Only eat bears when instructed. That is crucial!

You may eat bears when you see this symbol:



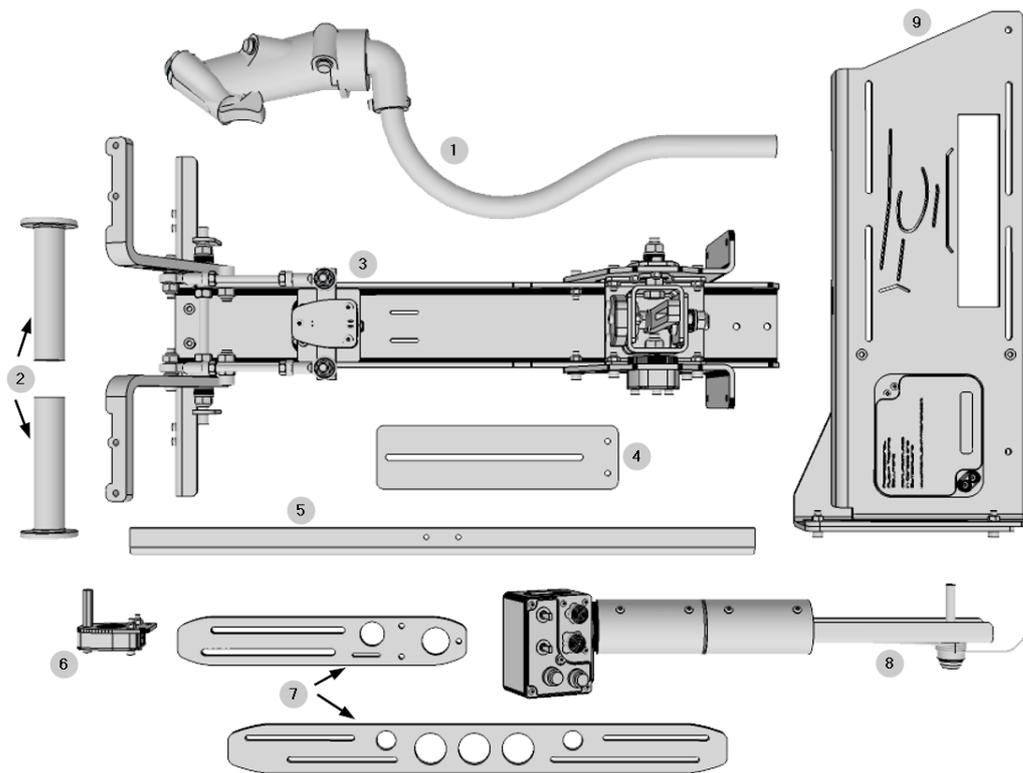
The next pages show how to assemble the PUMA X flight controls.

Never use excessive forces.

Contact us if something is not working out, we are happy to assist you and get it sorted out.

Note that most pictures are not showing the wiring/cables for easier assembling experience. The wires are shown in the “wiring guide”.

Please note that Serial number XXXDXXX and upwards use a different pedal main frame, a rectangular tube instead of a U channel piece. All steps involved in assembling are the same of not stated otherwise.

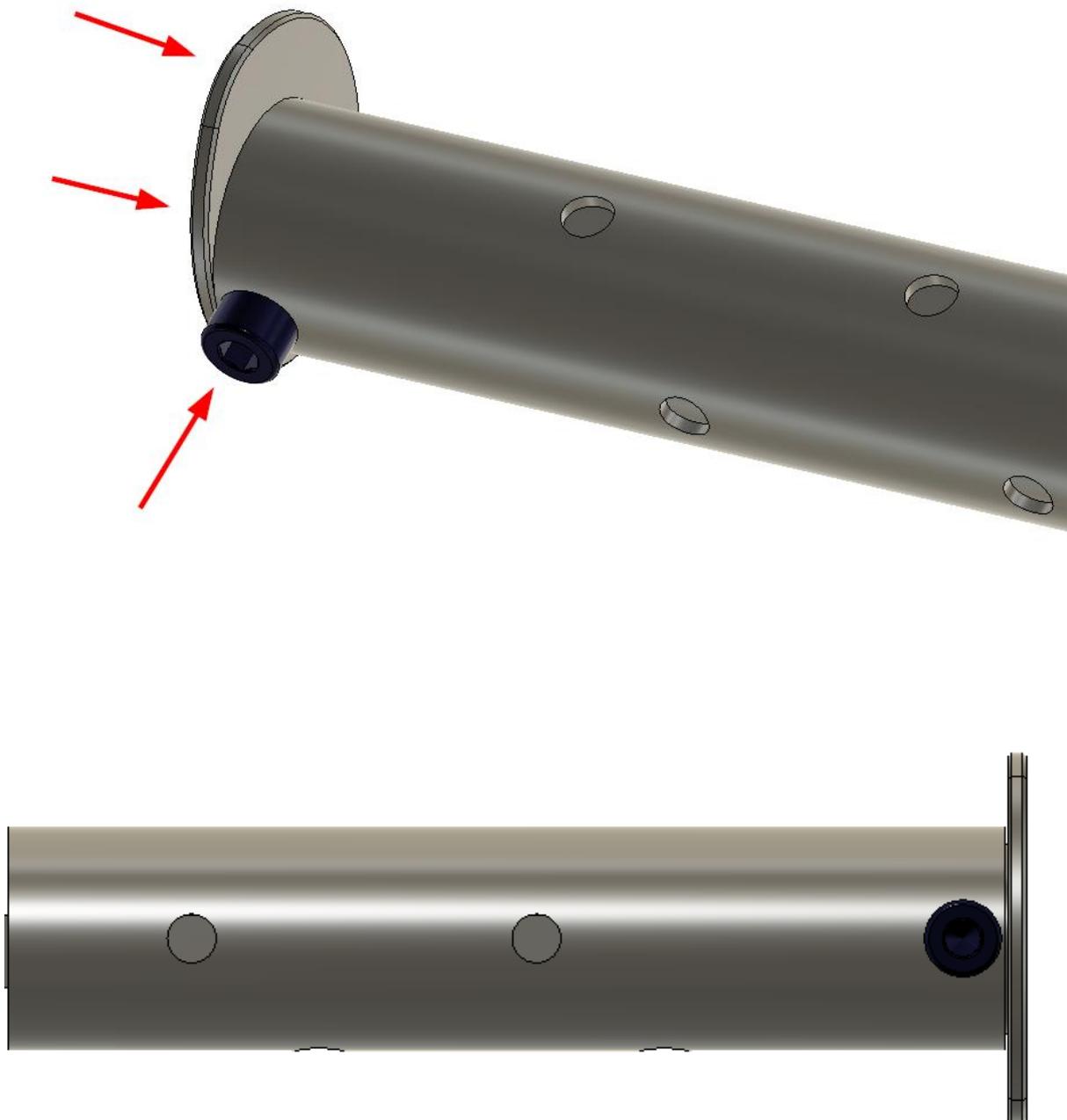


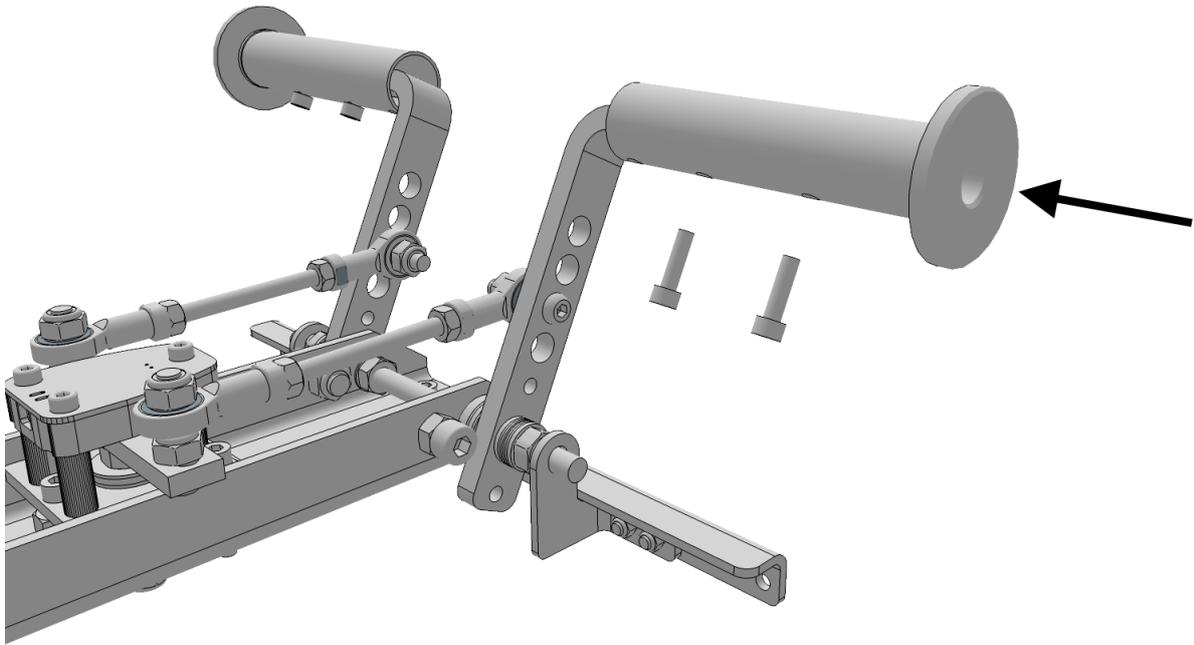
- 1- Cyclic grip assembly
- 2- Pedal tubes (+ end caps - serial 24Jxxxx onwards)
- 3- Central frame
- 4- Seat blocker plate
- 5- Seat blocker bar
- 6- Collective sensor assembly
- 7- Collective arms
- 8- Collective assembly
- 9- Back frame

serial 24Jxxxx onwards, note the slightly different end cap style change.

Assemble the pedal end cap with a M5x18mm screw

Repeat for each pedal tube side.

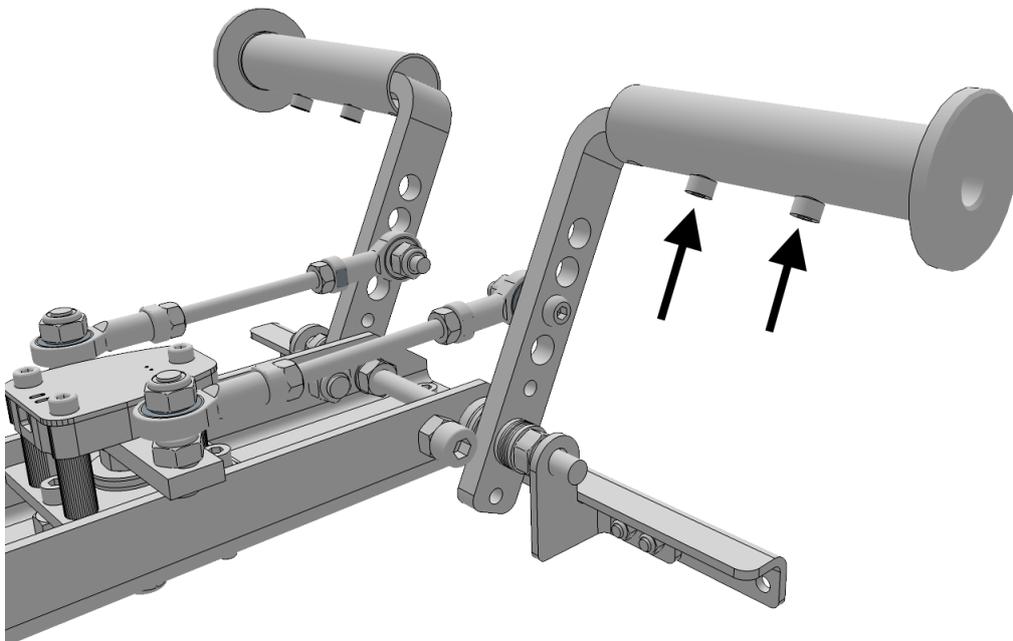




Insert pedal tube

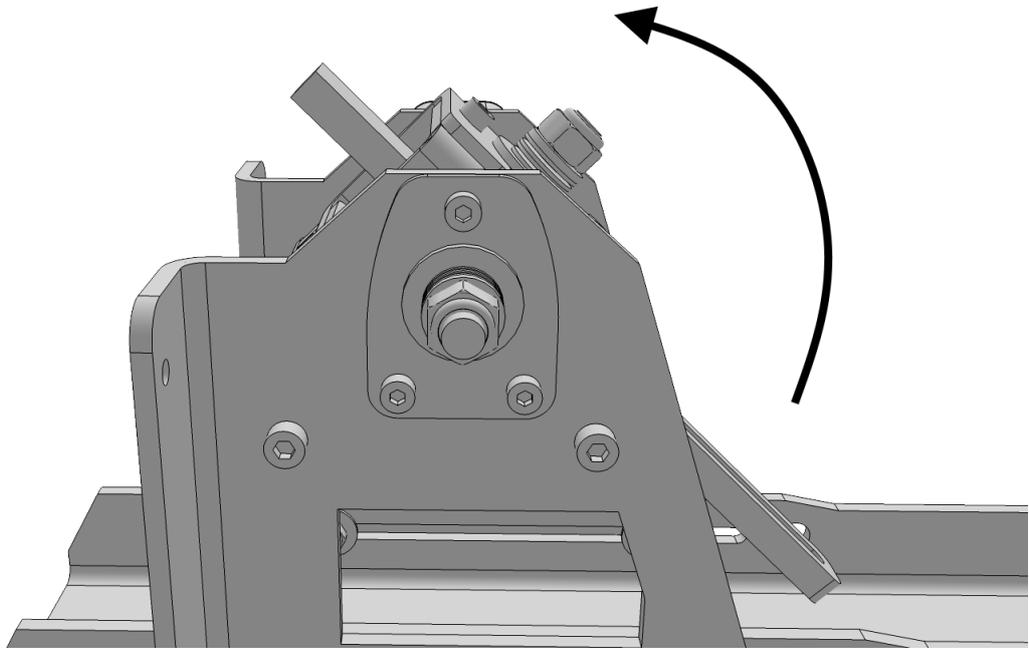
Use the line of 3 holes to mount the pedal. First hole stays empty.

The extra line of holes is only used for toe brakes kit

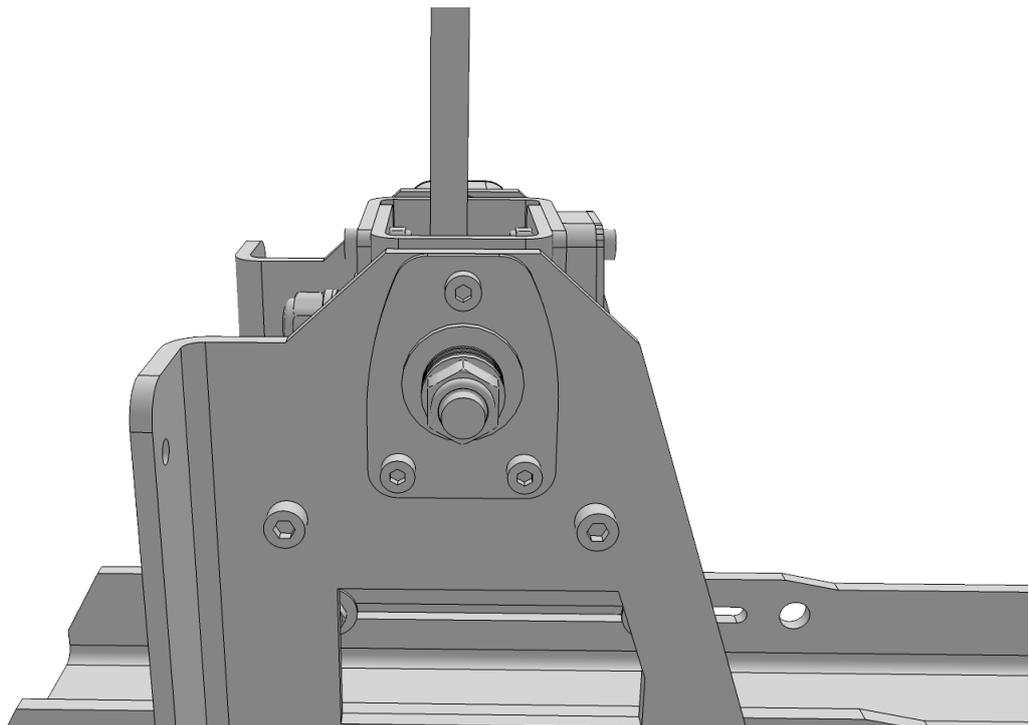


Tighten both screws, repeat on both side

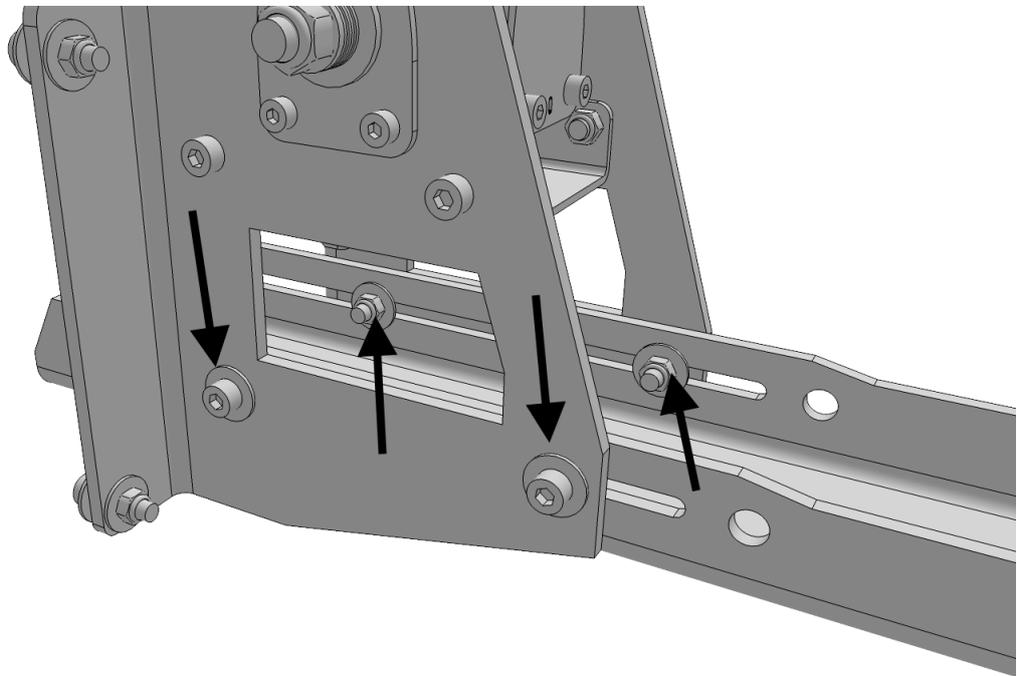
Gently rotate and lift cyclic bar



Watch that no wires get pinched

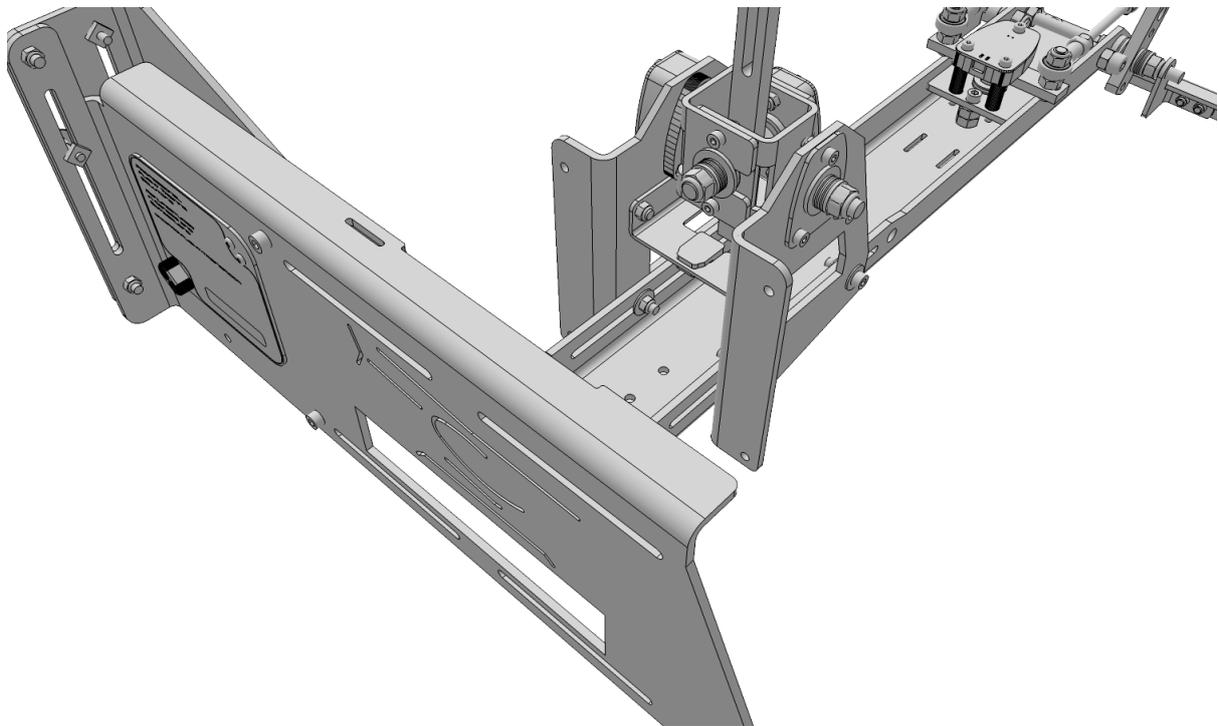


Cyclic bar should be roughly vertical

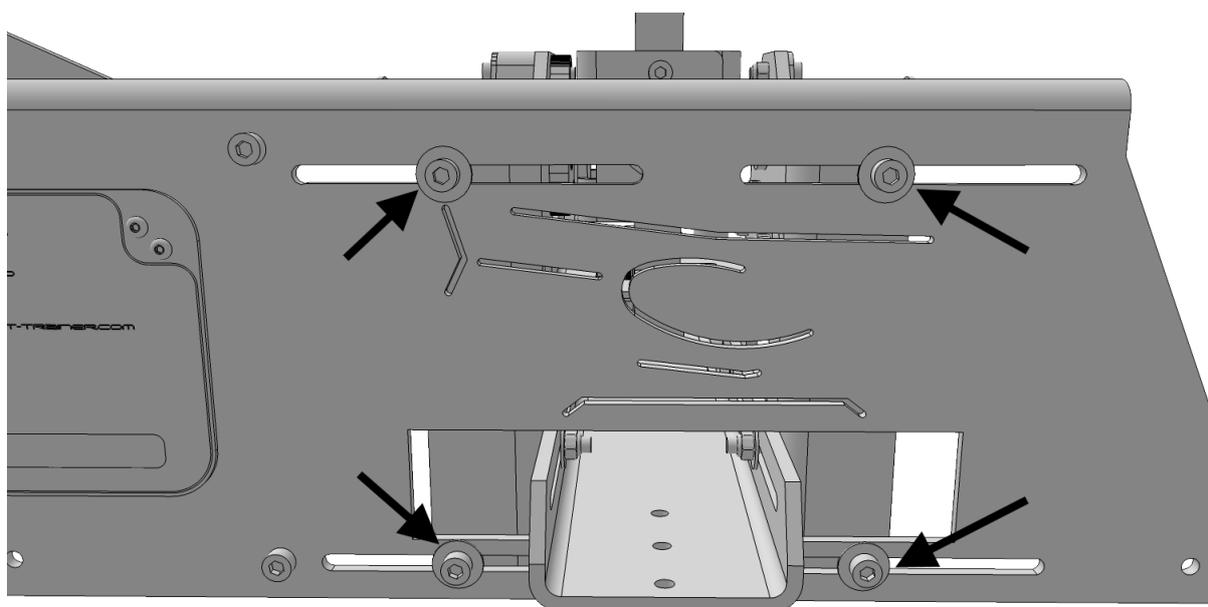


Loosen 4 bottom screws, don't remove! Just loosen slightly!

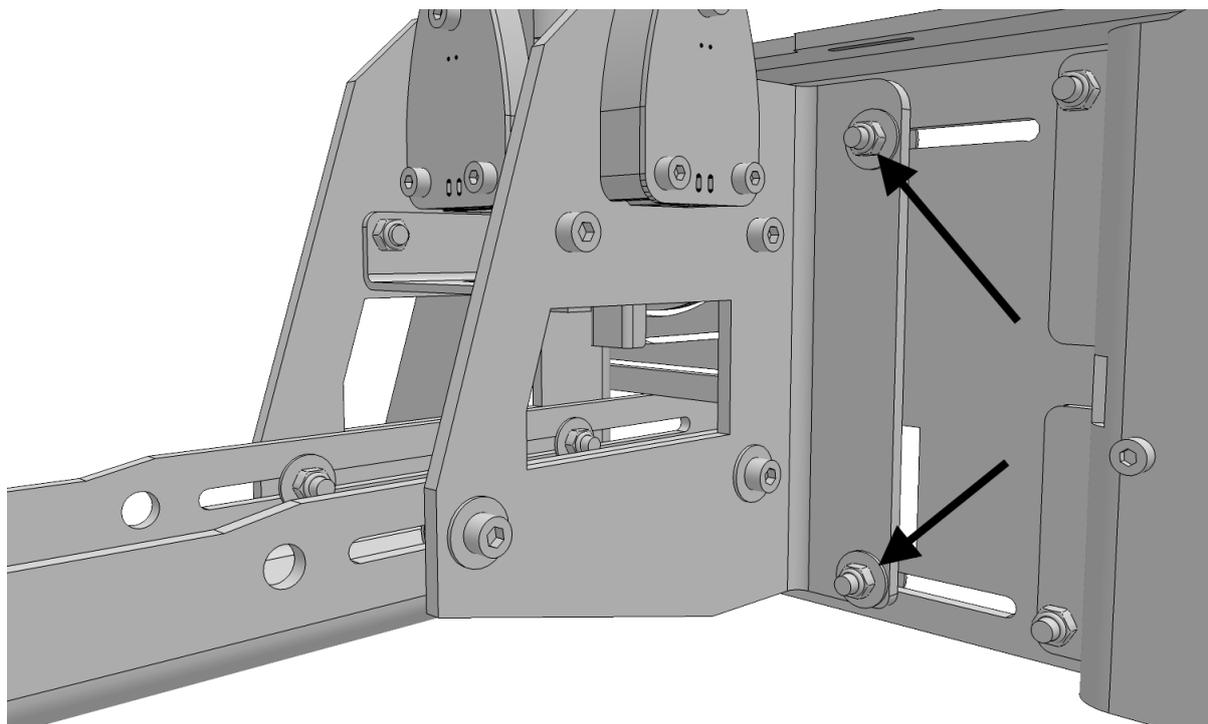
prepare the frame assembly attachment



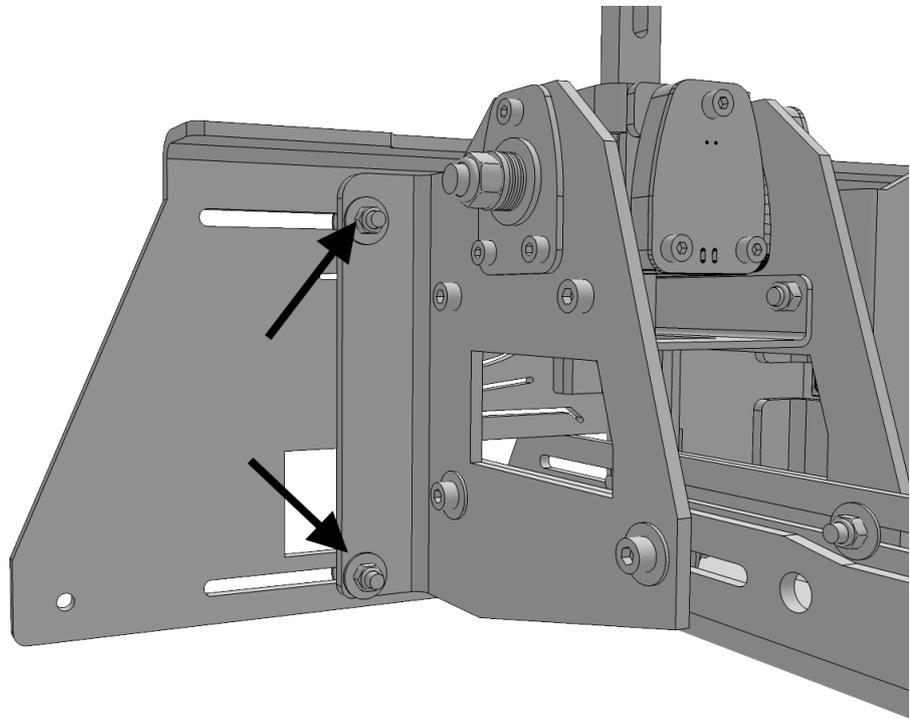
Insert the back frame



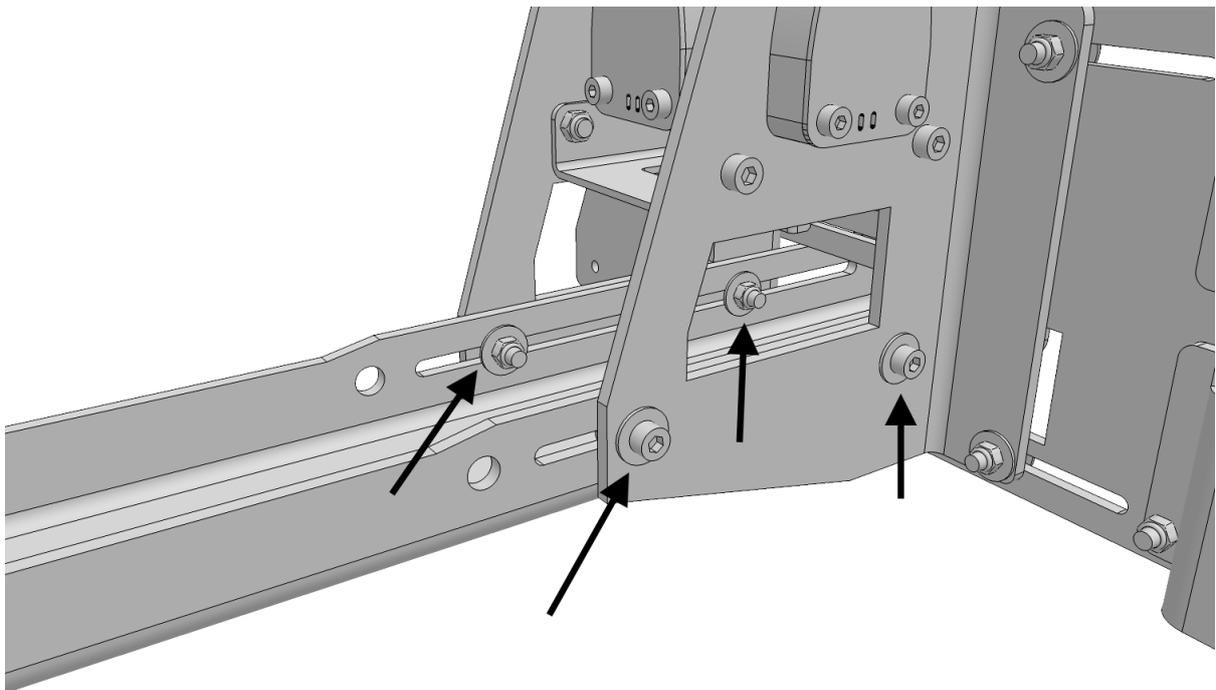
Insert 4 M5x18 screws, M5 standard washer on both side and secure with M5 lock nuts



Tighten the left frame screws



Tighten the right frame screws



Tighten the 4 bottom screws

Congratulations! 1/4 through!

Eat 2 bears because you deserve it 😊



The next steps cover assembling the collective assembly.

If you own a PUMA X serial number **XXXA**XXX or **XXXB**XXX

Please follow the next steps.

If you own a PUMA X serial number **XXXC**XXX or higher D etc..., **jump to the section-> Collective assembly C or higher Version. -> Page 27!**

Take your time, this is the most “challenging” part 😊.

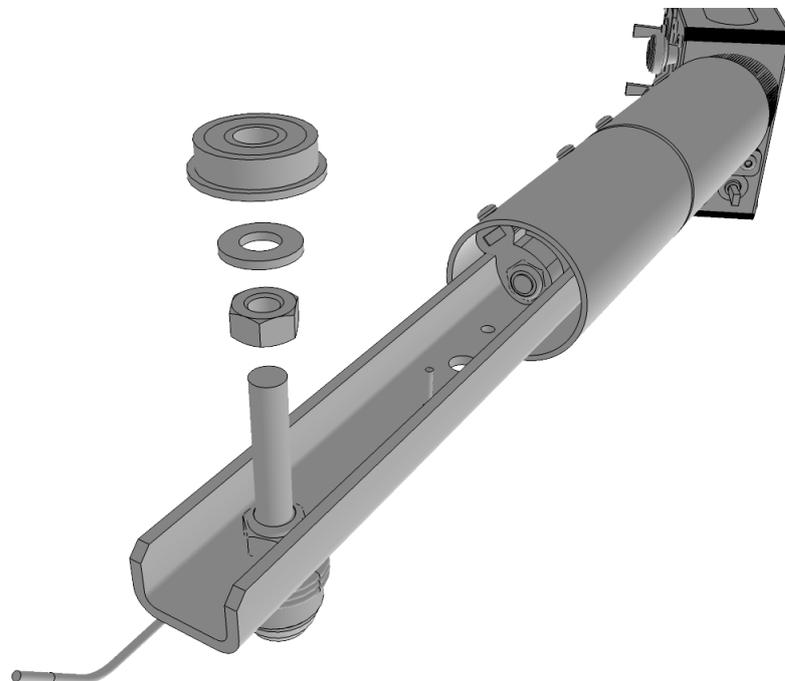
Note: the protective piece on the toggle switches is just for transport and can be thrown away.



Take all components from the small transparent bag.

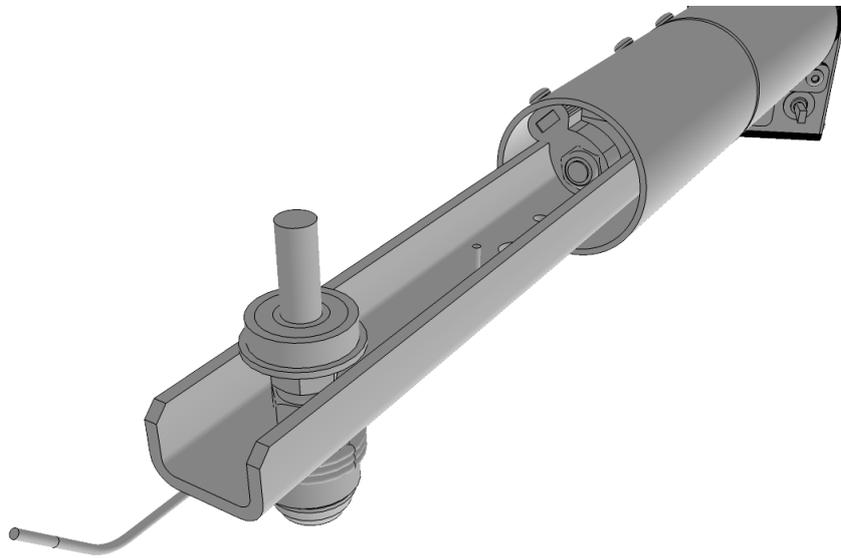
Start by placing the collective main assembly flat.

Prepare the flanged bearing, a M8 standard washer, and a M8 standard nut



Add the nut, make sure there is no space left between both nuts on the axis after tightening the standard nut by hand.

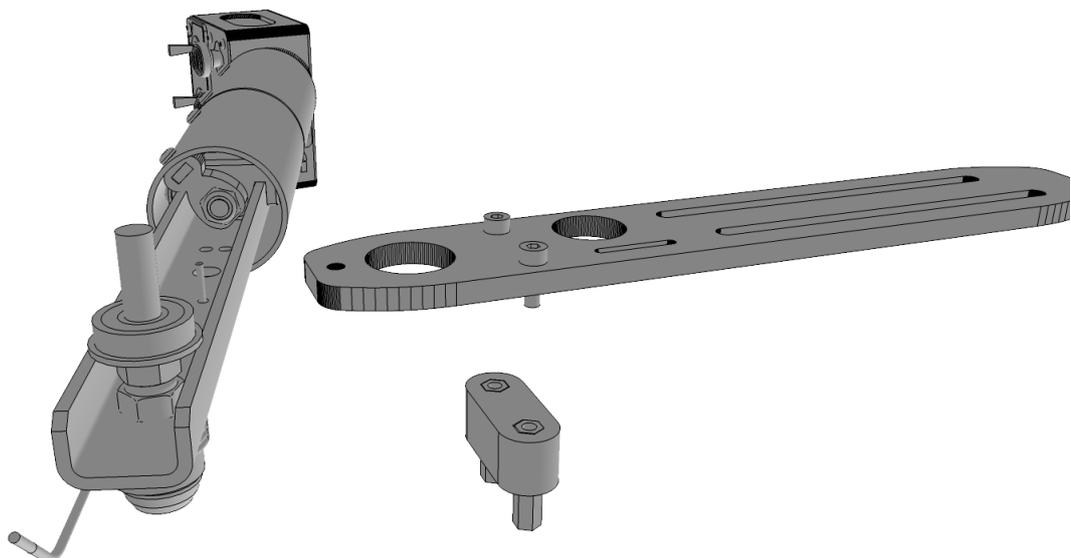
Add the washer, and finally the flanged bearing. Flanged on bottom side.



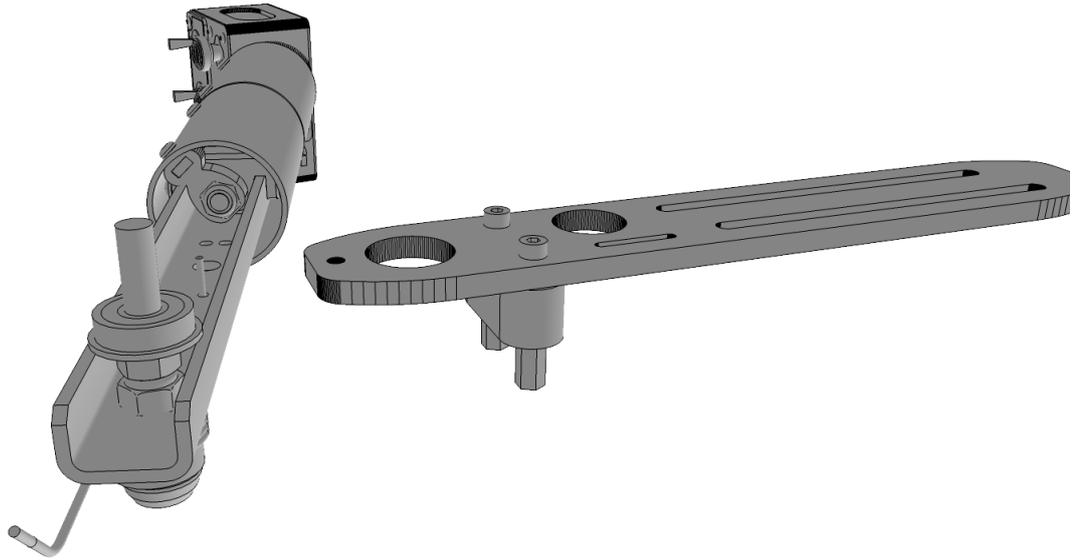
Prepare the upper arm, the collective range limiter, and both standoff. Also prepare 2 socket cap screw M4x12mm

Insert both standoff in the collective range limiter.

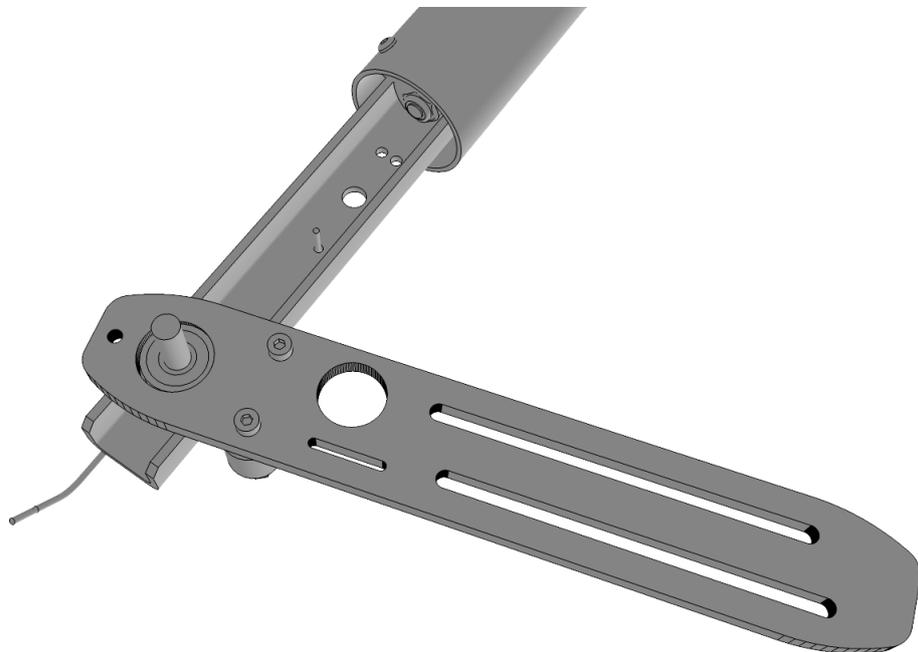
The limiter piece is recommended unless you need a very large range for the collective. It can always be removed later.



Tighten the screws into both standoffs.



Place the upper arm assembly over the collective axis screw.  
Make sure that the bearing is fully flat against the bar.  
There is a small gap on the top part once assembled.



Prepare the M8 large washer, 4 M8 disc washers, the remaining M8 standard washer, the M8 lock nut and the collective screw cover.

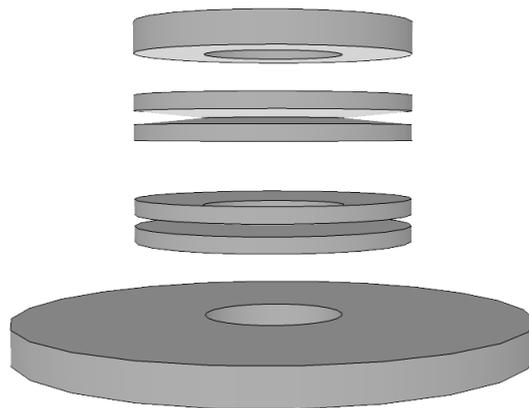
Note that we are goanna use a stack of washers. It is important to have all washer's orientation correct in order to achieve best friction experience.

First the large washer.

Then 2 pairs of disc washers.

Finally, the standard washer on top.

Each disc pair is made of 1 disc facing up and 1 disc facing down. This detailed view shows how to add the washer stack.



Add the washers, then add the lock nut.

Don't overtighten the lock nut. Best practice is to tighten till the disc washers can't be rotate by hand. Then add  $\frac{1}{4}$  -  $\frac{1}{2}$  of a turn. The collective arm is mainly supported by the spring, no need to add lots of friction.

There is a detailed friction explanation and guide attached at the end of this manual.



Congratulations, you finished the right end side.

Only a few more steps and the collective will be ready!

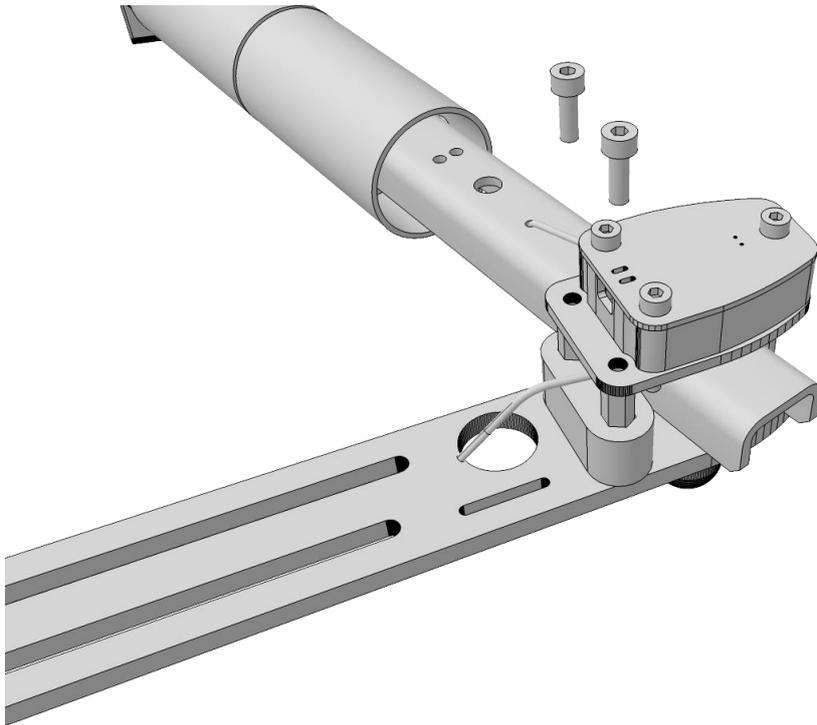
Flip the collective on its other side.



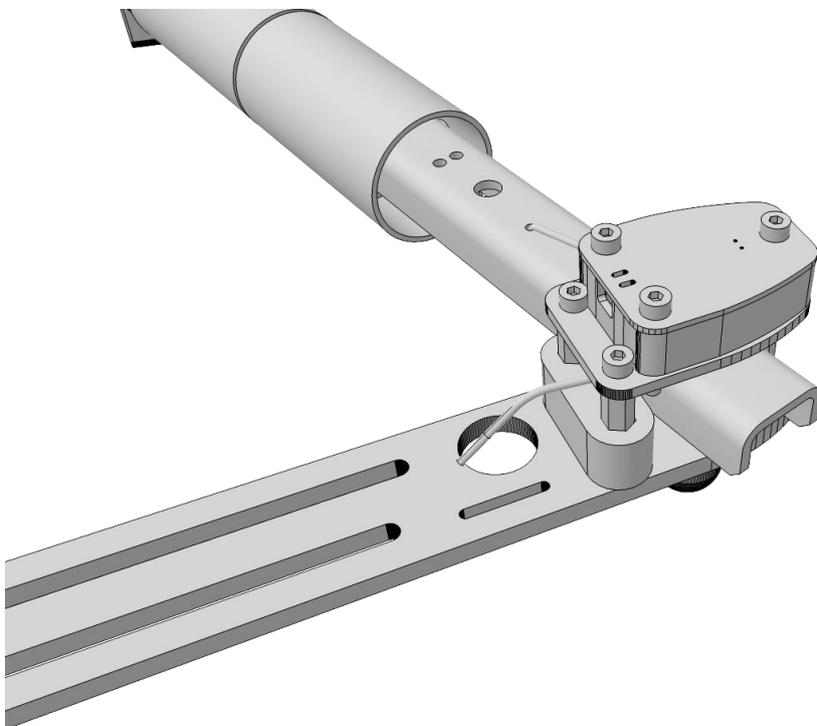
Tension the spring by pulling its right side between both standoffs.



Add the collective sensor on top. Make sure its fully inserted over the bearing, and all 3 standoffs are touching the plate and the arm.

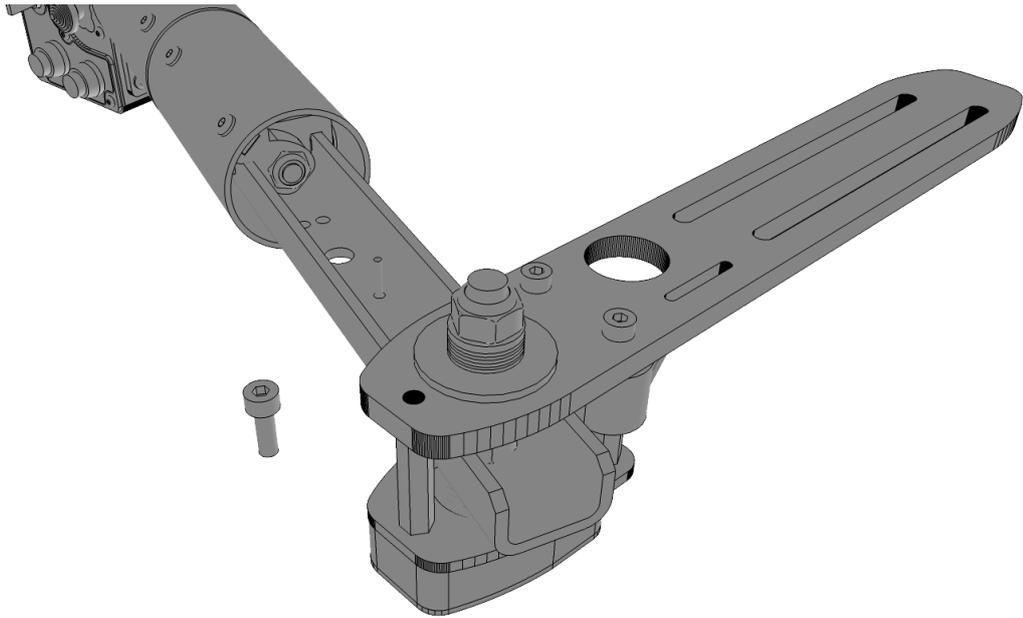


Prepare 2 M4x12mm screws and insert them to secure the sensor plate.

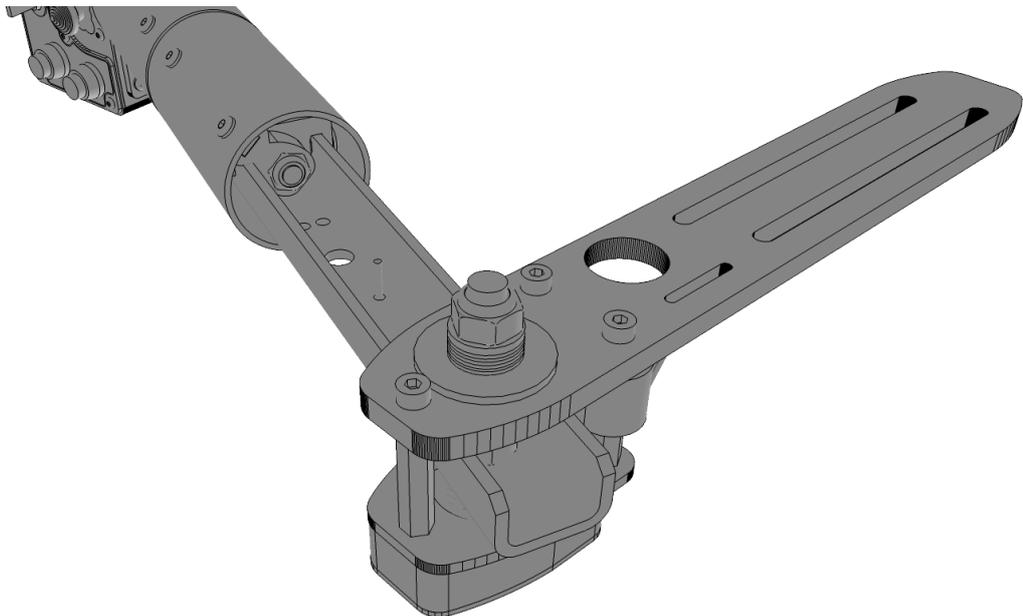


Flip the collective.

Prepare 1 M4x12mm screw

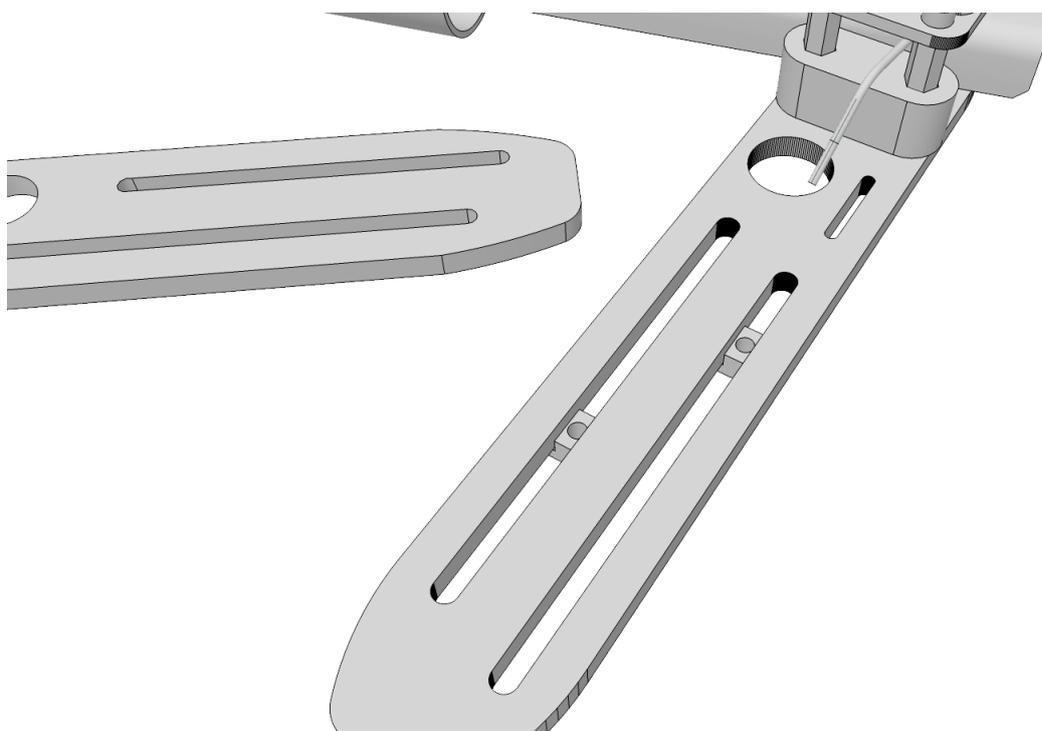


Insert and tighten the screw.

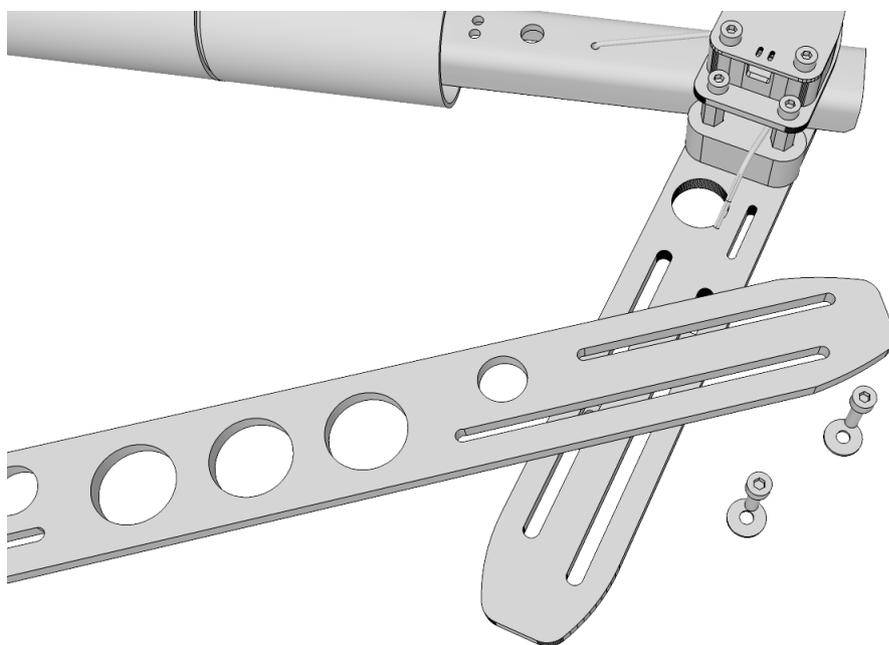


Flip the collective again, and prepare 2 M4 t-nut, 2 M4 standard washers and 2 M4x16mm screws. (The shorter of the 4 remaining screws.)

Insert the t-nut as shown.

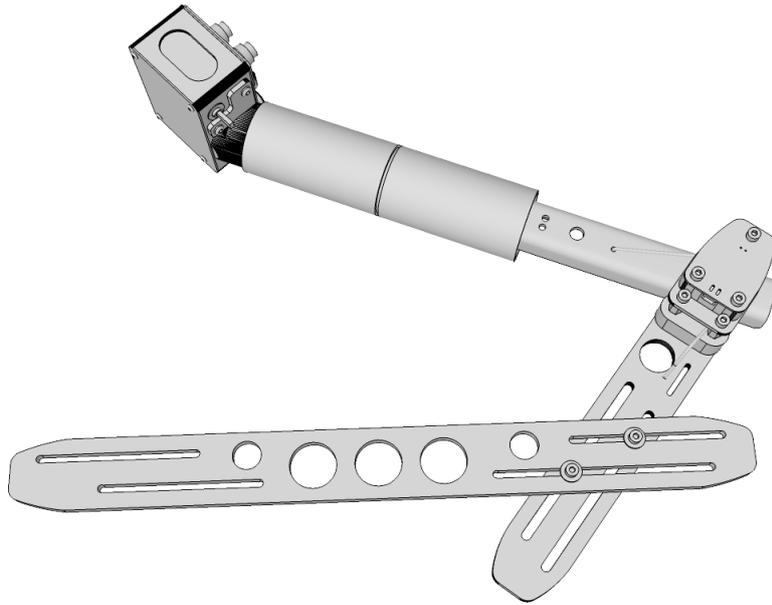


Note that you may assemble the bottom arm flipped or mirrored if it suits your case better, the recommended starting position is as shown. Small holes up; same length slots left.



Add both screws using 2 M4 washer.

Tighten both screws.



Congratulations! Halfway through! 😊

That's Is certainly worth some reward:



Collective assembly C Version:

Take your time, this is the most “challenging” part 😊.

Note: the protective piece on the toggle switches is just for transport and can be thrown away.



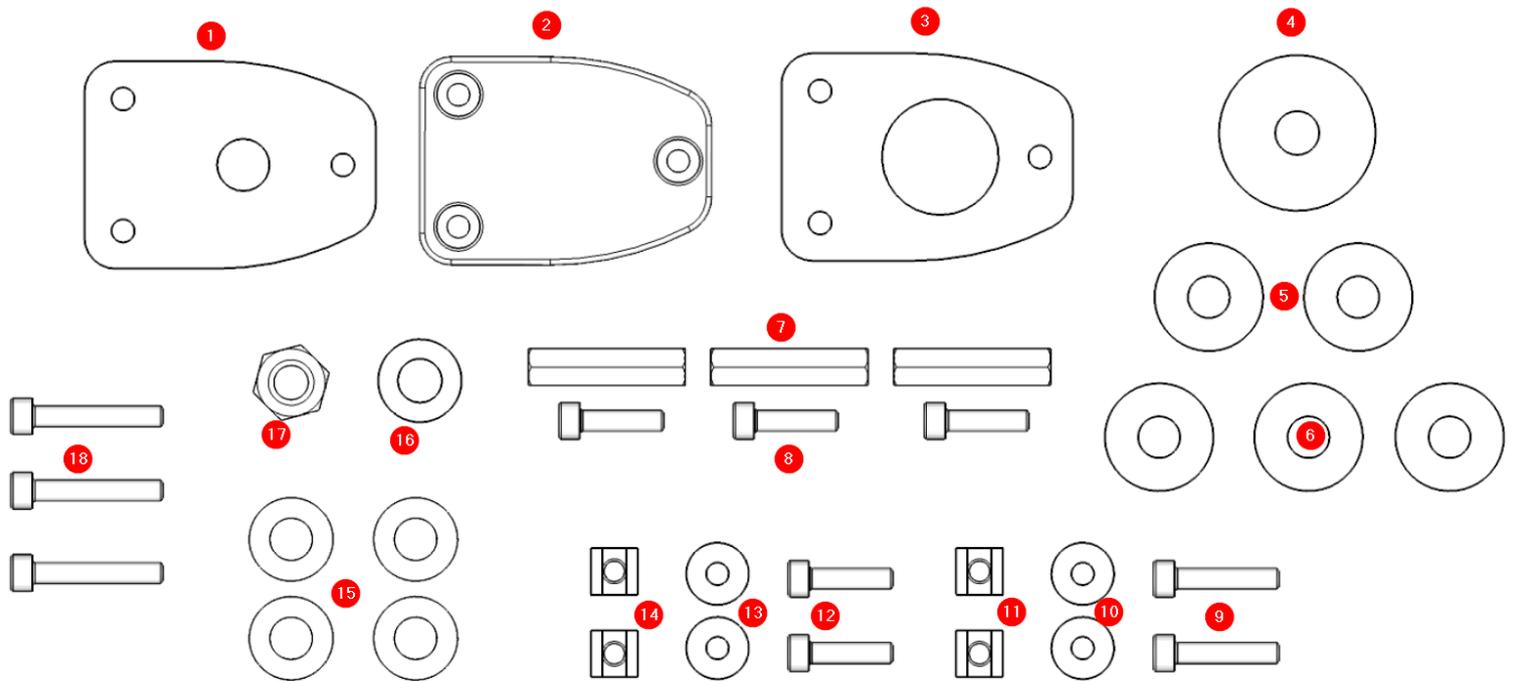
The toggle cover can be used on any of the 3 collective toggles.



Take all components from the small transparent bag.



## Revision C (or higher) small parts overview for collective



- 1- Right side plate
- 2- Sensor cover
- 3- Left side plate
- 4- M8 Large washer
- 5- M8 Needle bearings (2)
- 6- M8 Needle washers (3)
- 7- M4 x 30mm standoffs (3)
- 8- M4 x 16 socket screws (3)
- 9- M4 x 20 socket screws (2)
- 10- M4 standard washers (2)
- 11- M4 t-nuts (2)
- 12- M4 x 16 socket screws (2)
- 13- M4 standard washers (2)
- 14- M4 t-nuts (2)
- 15- M8 disc washers (4)
- 16- M8 standard washer
- 17- M8 lock nut
- 18- M4 x 20 socket screws (3)

Start by assembling the upper arm

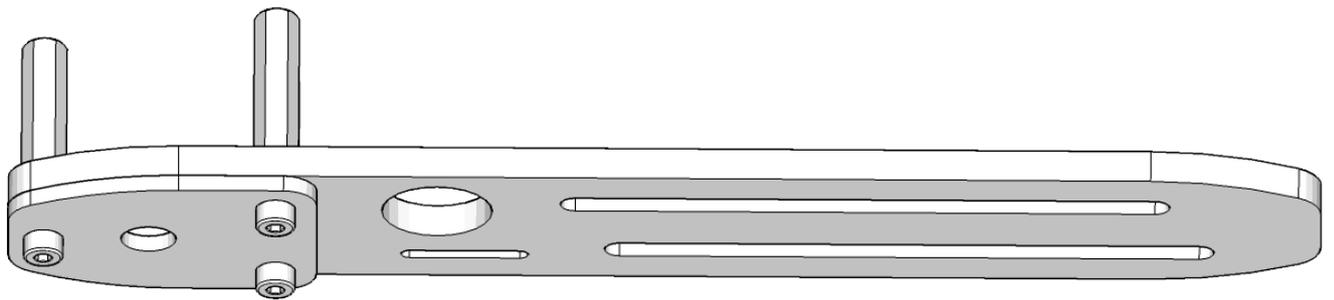
Use:

M4 x 16 socket caps (3)

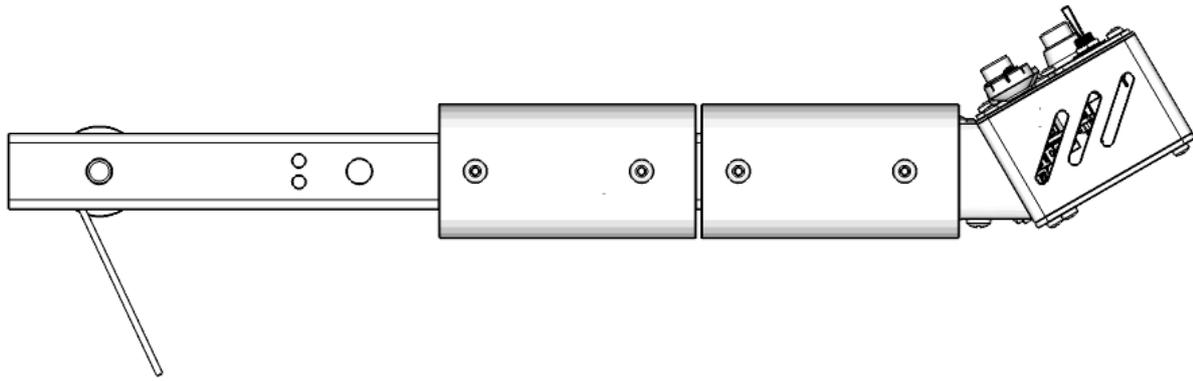
Right side plate

Upper arm

M4 x 30mm standoffs (3)

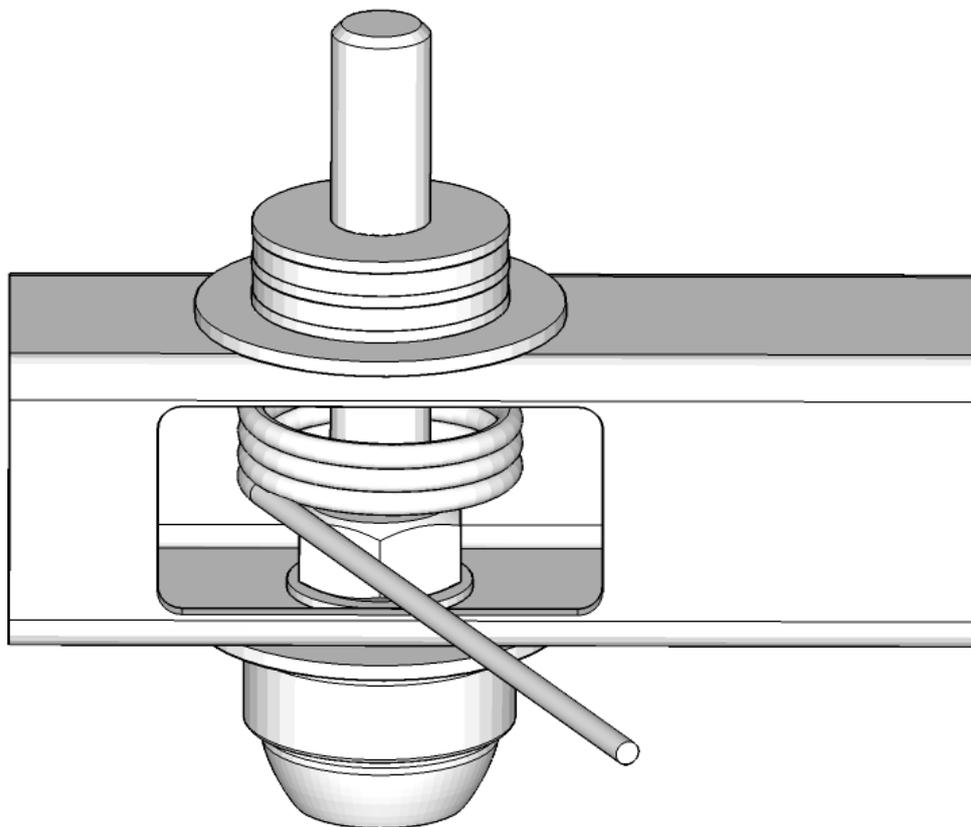


Place the collective assembly flat on its left side.



Stack the washer and needle bearings as shown in the picture

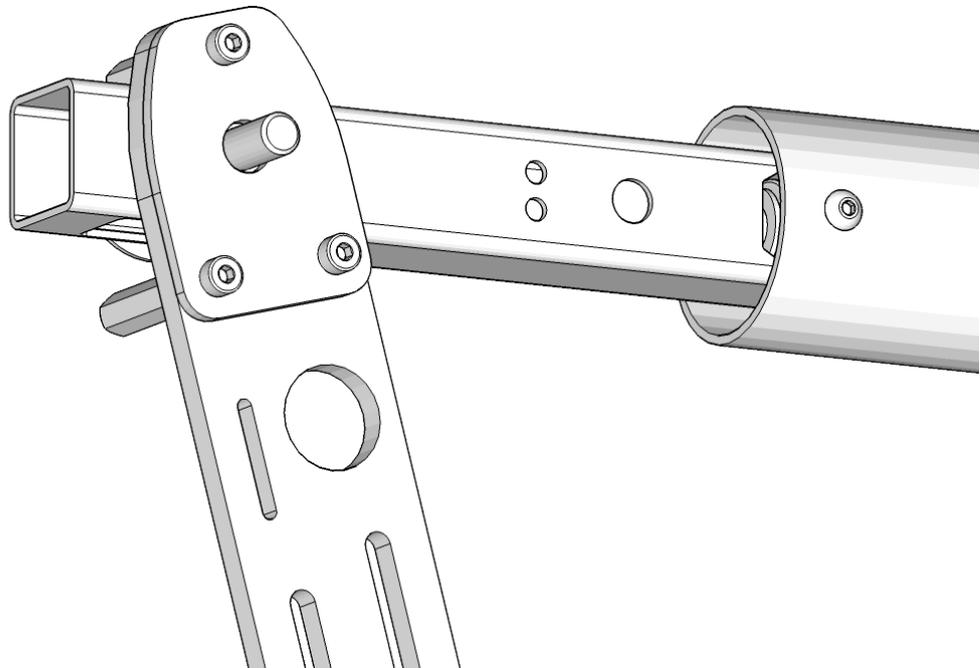
- Needle washer
- Needle bearing
- Needle washer
- Needle bearing
- Needle washer
- M8 Large washer



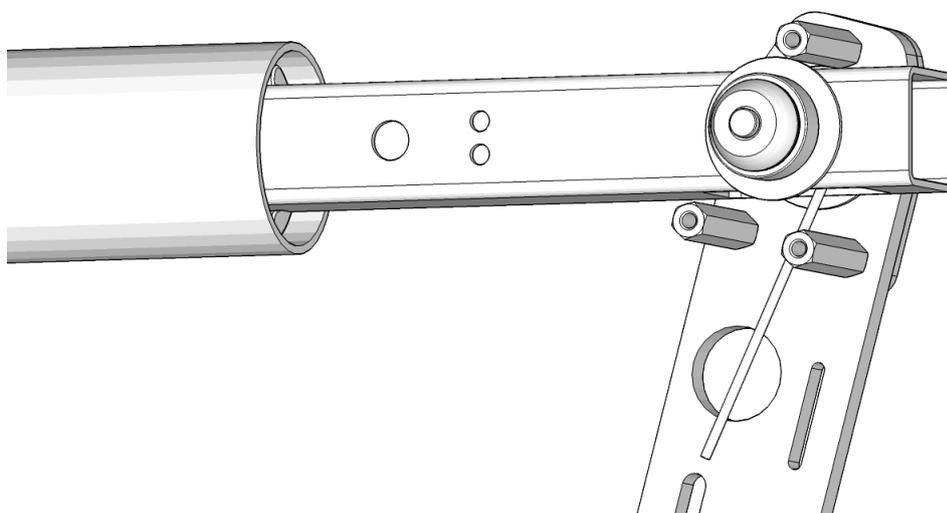
Place the upper arm assembly on top of the collective axis shaft.

Make sure the cables are not pinched.

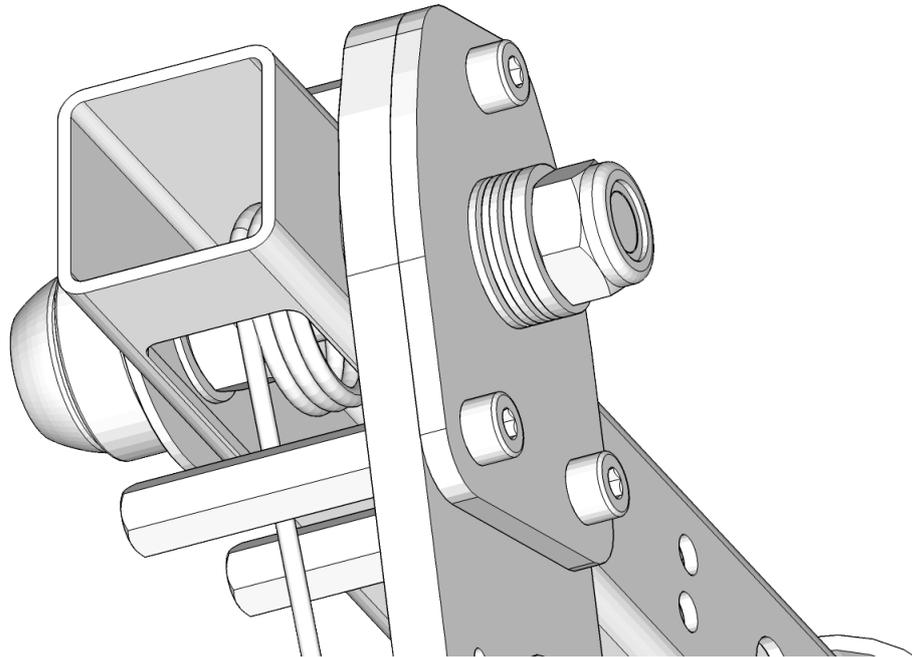
Make sure the spring is between the standoffs.



Lead the spring and cables between the standoff



Stack the disc washers (4), standard washer, and lock nut as shown in the picture

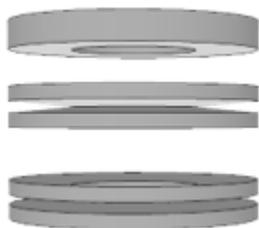


It is important to have all washer's orientations correct to achieve the best friction experience.

2 pairs of disc washers.

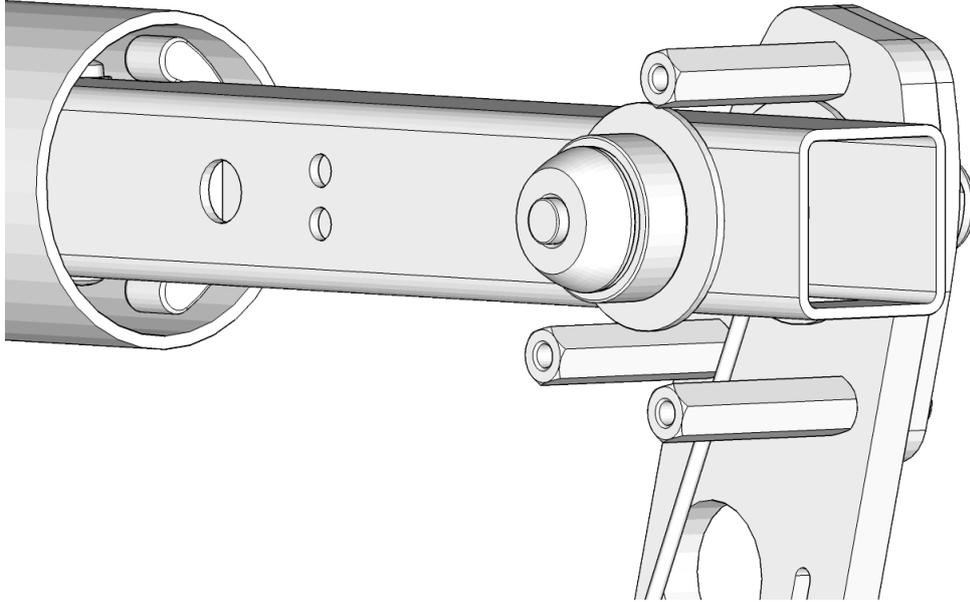
the standard washer on top, and the lock nut at the end.

Each disc pair is made of 1 disc facing up and 1 disc facing down. This detailed view shows how to add the washer stack.

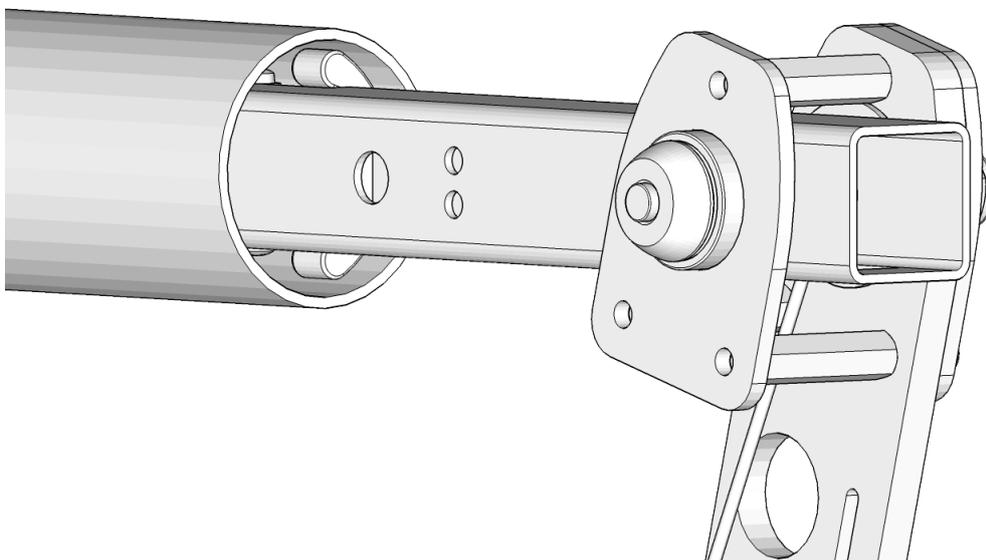


Tighten the lock nut, enough to maintain position. Use this nut to increase or decrease friction.

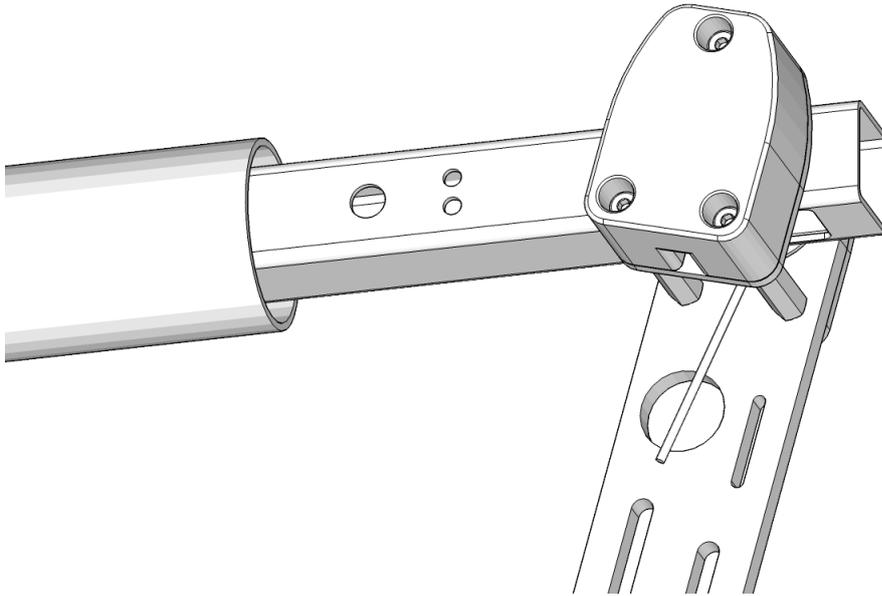
Flip the collective assembly and place it on its right side.



Insert the left side plate.



Install the sensor cover using M4 x 25 screws (3)

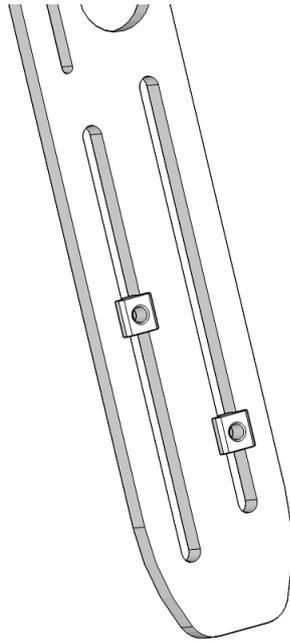


If you struggle to insert the screws, you might need to slightly untighten the screw on the opposite side to properly align the standoff.

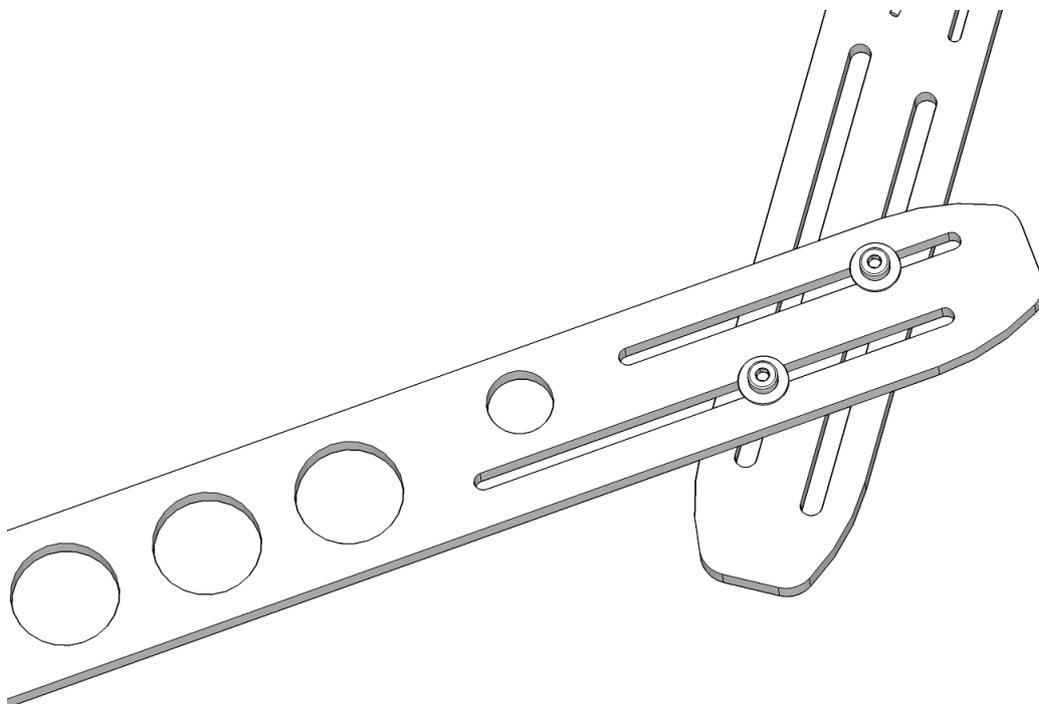
Make sure to tighten everything up after installation.

Prepare the lower arm and remaining fasteners.

Insert 2 t-nuts in the upper arm's slots.

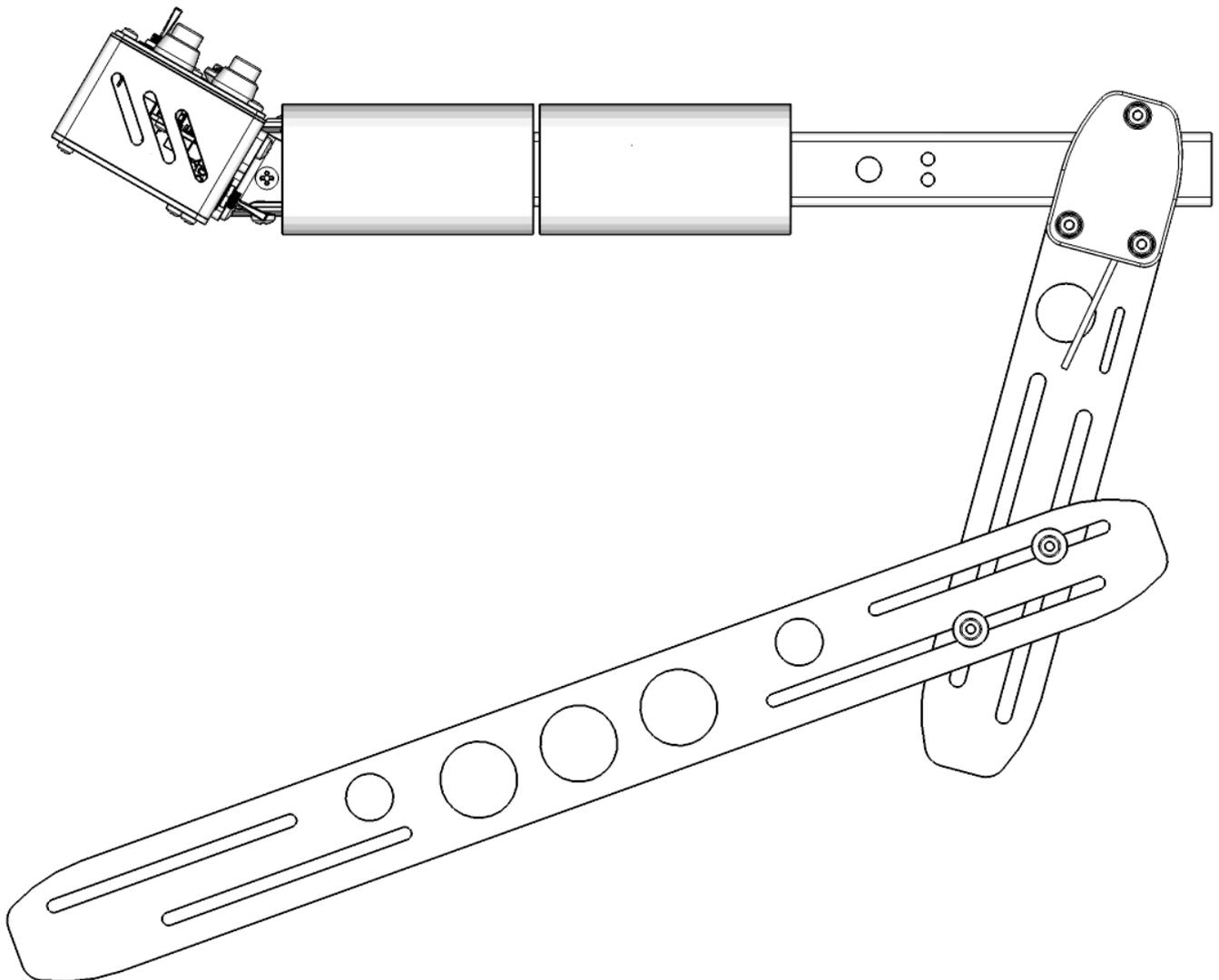


Use M4 x 16mm screws (2) and M4 standard washers (2) to attach the lower arm.



You have completed the collective assembly process.

Compare with the picture below.

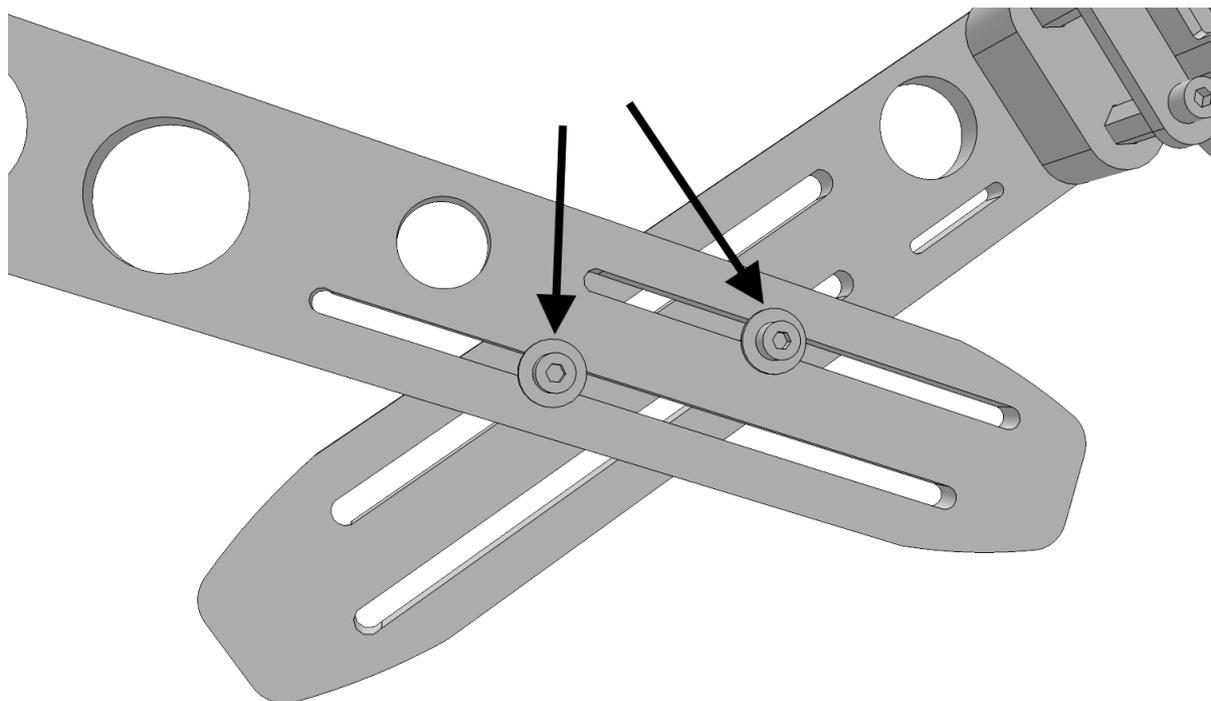


Congratulations! Halfway through! 😊

That's certainly worth a couple of bears!

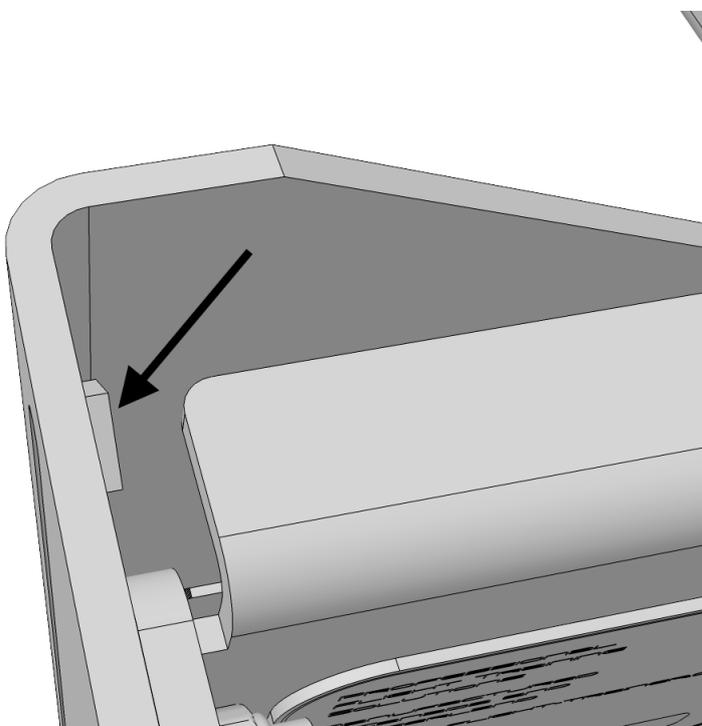


We are now goanna attach the collective to the frame

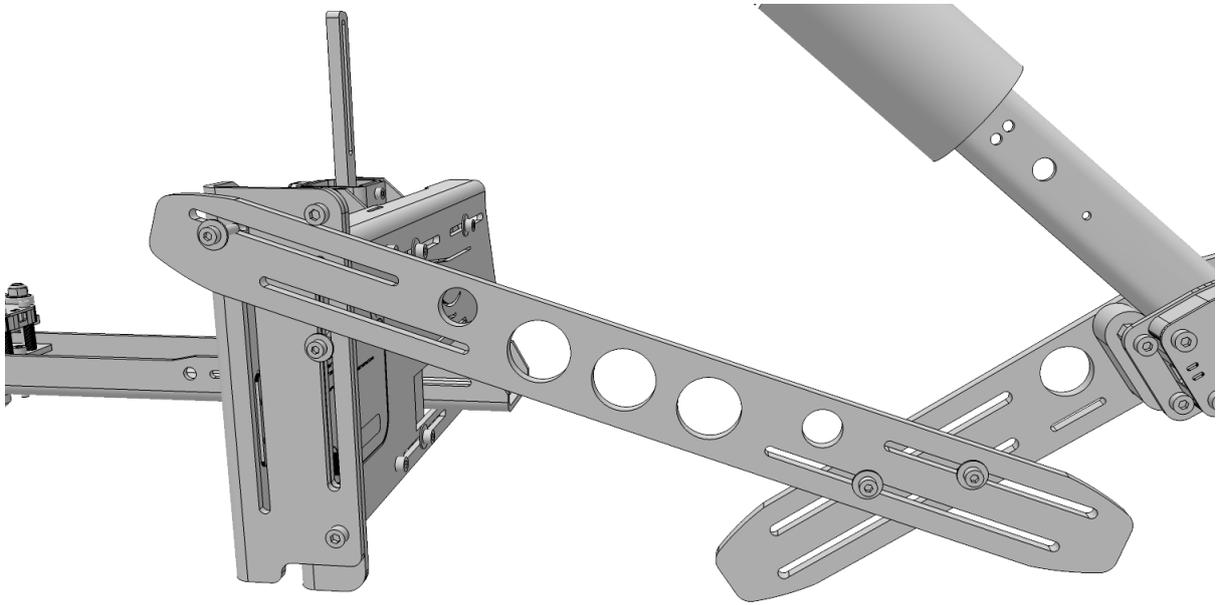


Loosen 2 screws on collective arm and adjust both arm pieces roughly as shown on picture. Retighten.

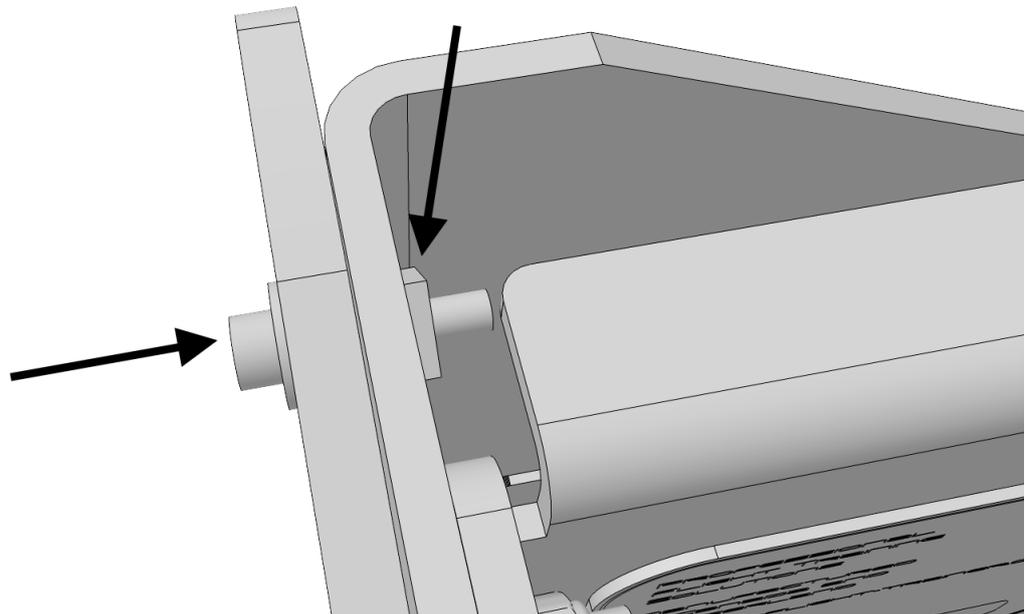
Prepare a M4x20mm screw, a t-nut and a M4 standard washer.



Insert a M4 t-nut and hold it with one hand.



Place the collective arm (touches the ground on the right side) to fit the upper t-nut position

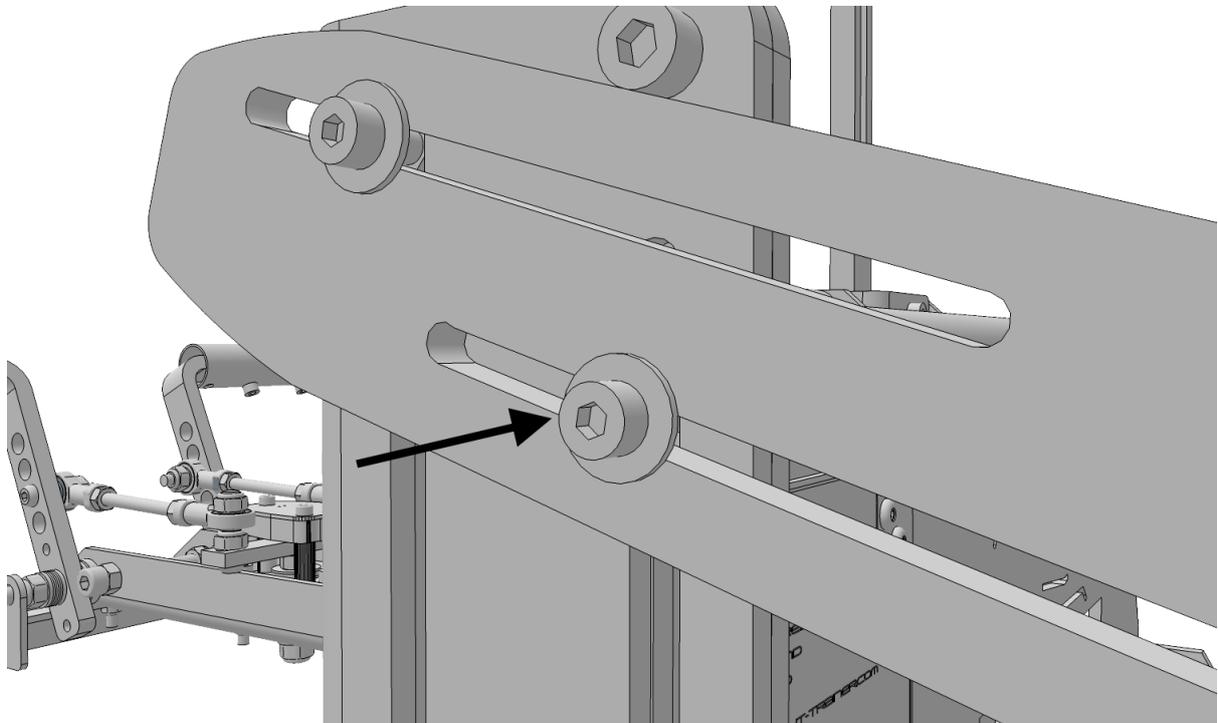


Insert the screw (if the nut falls during the process, just put it back in place at the top)

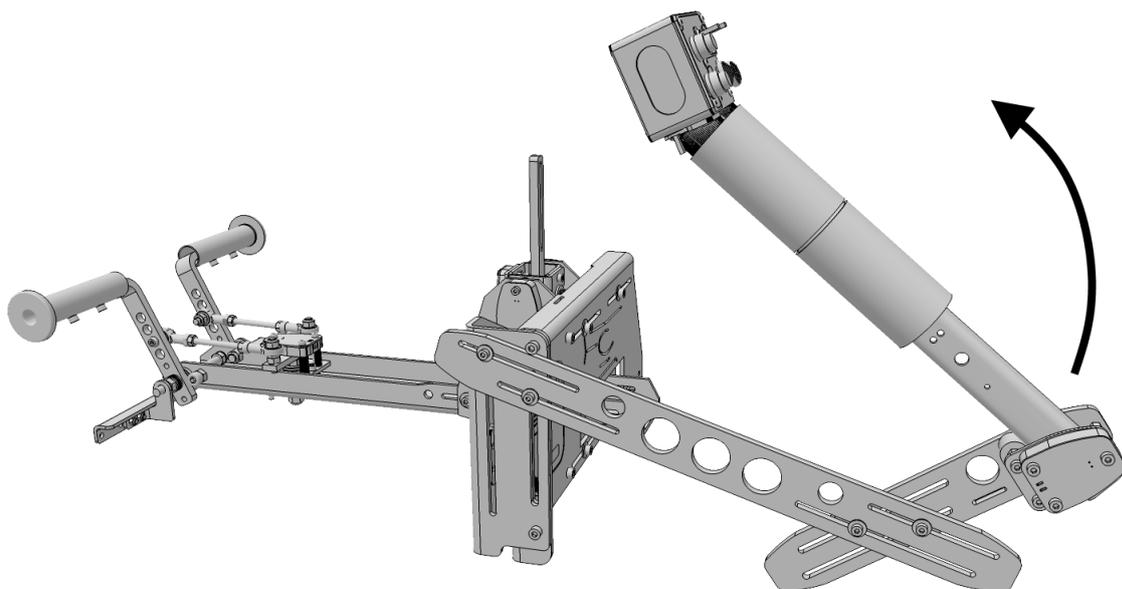
Slightly tighten the screw

Prepare a m4x20mm screw, a t-nut and a standard M4 washer.

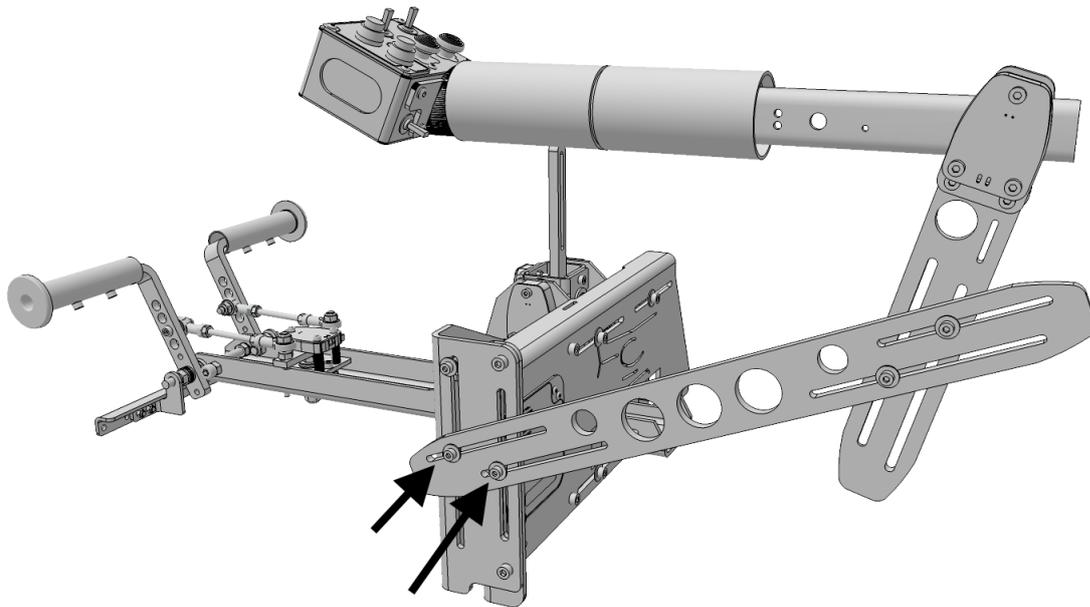
Hold the t-nut in position and insert the screw with the washer.



Insert the lower collective screw and slightly tighten it



Rise the collective assembly; loosen both collective screws if you tightened too much



Once you are happy with the placement, you can tighten both collective screws, don't use too much force or you will damage the screw heads!

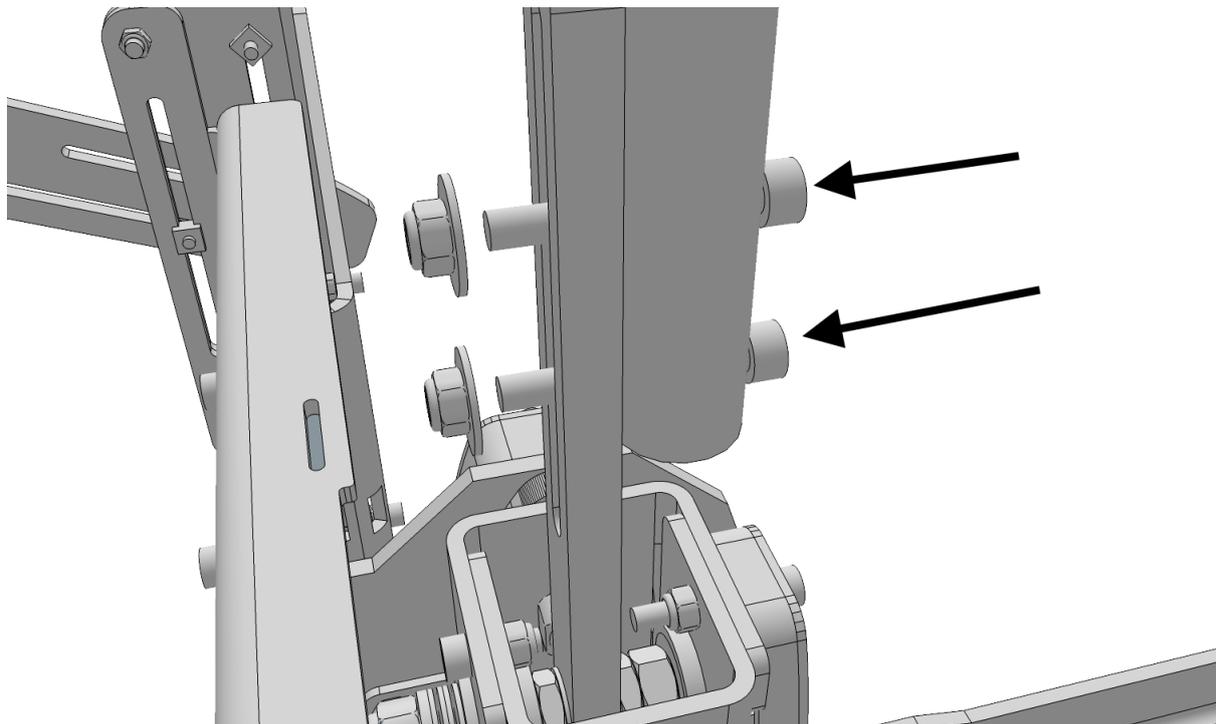
Eat 2 bears only.



Resist the temptation to eat all remaining bears!

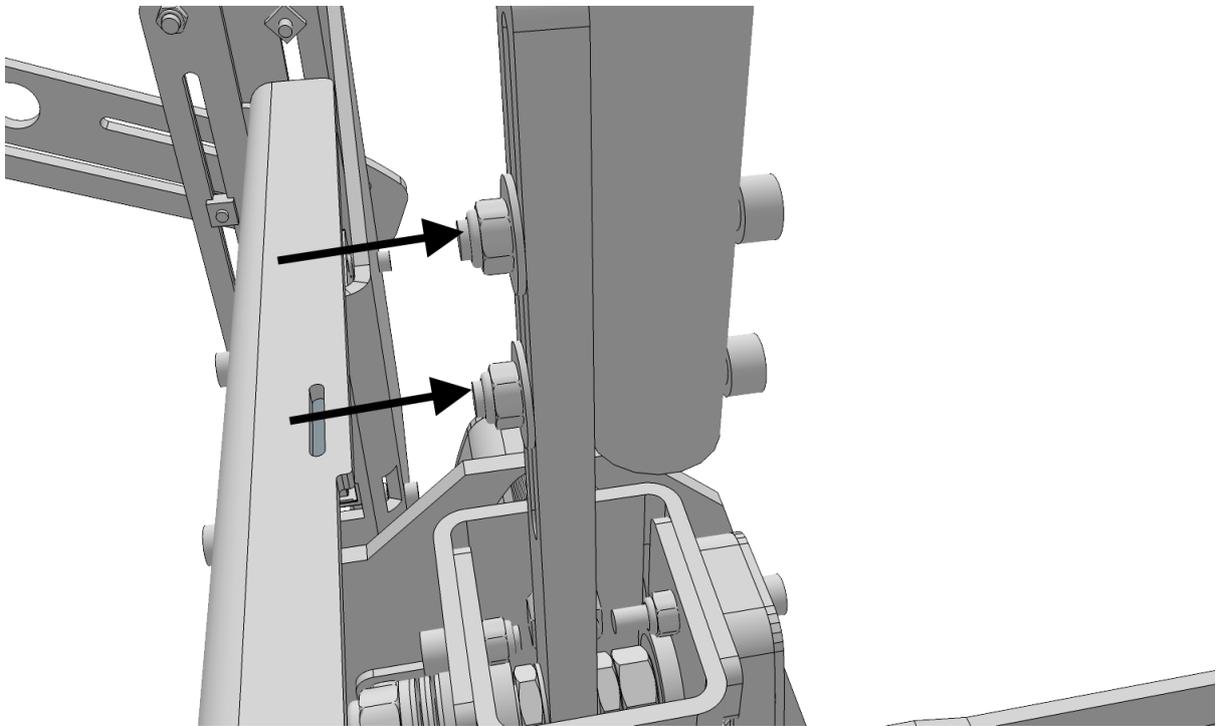
We know it's hard.

But you can do it!



Loosen the nuts on the cyclic assembly and insert the screws on the cyclic bar. Don't remove the screws from the cyclic curved tube!

If the screws are not installed on the tube, use the M5 x 35 screws and M5 standard washers on each side.



Mount the nuts and tighten them.

If you own an **A-Style Cyclic Grip**, the M5 Lock nuts are replaced with M4 T-Nuts 👍. You should have a little bag with all the fasteners for the A-Style Cyclic grip!

### A-Style Cyclic Grip



Depending on your packaging Style, you might have to mount the Cyclic Grip on the curved tube. Start by releasing both M5 x 35mm button cap screws from the Cyclic Grip handle.



Insert the curved tube and align the holes.



Make sure the connection cable is not pinched while inserting the screws!



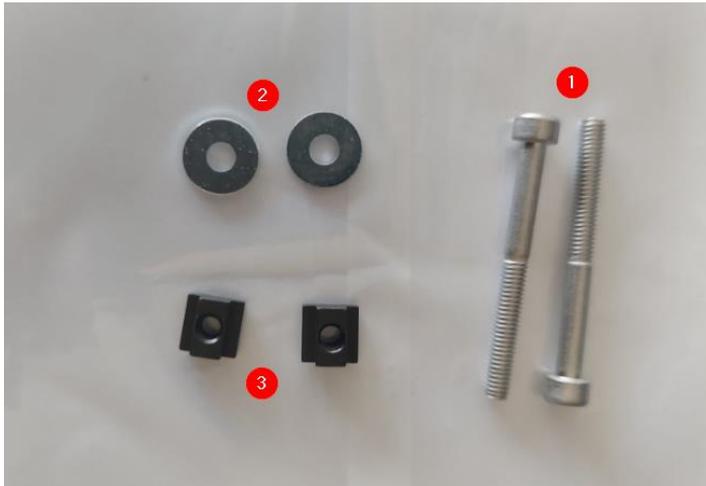
Tighten the screws just enough to prevent movement, no need to overtighten it 😊.

You can now attach the A-Style Cyclic grip with the new screws provided.

2x M4 x40mm Socket Cap Screws (1)

2x M4 washers (2)

2x M4 T-Nuts (3)



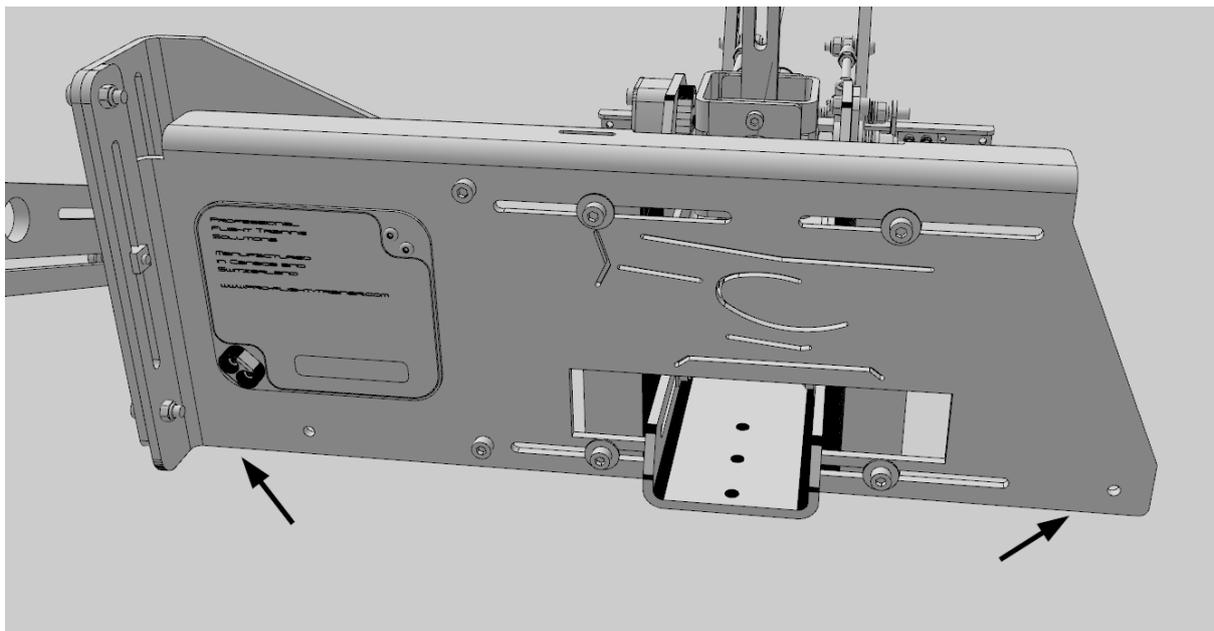
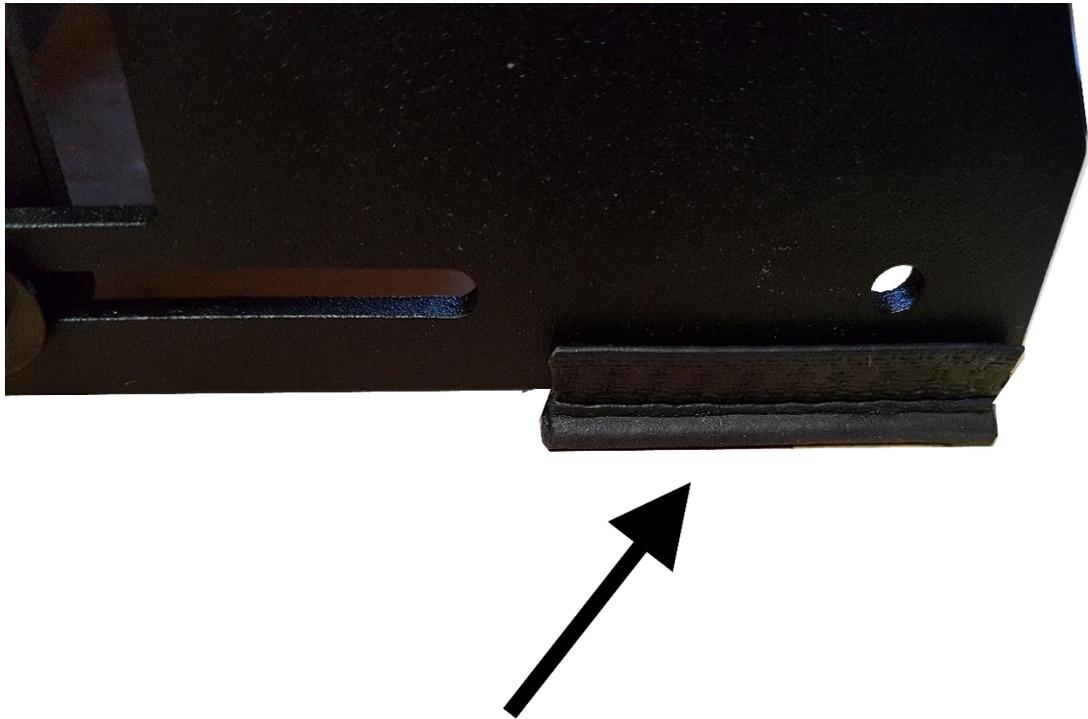
You did it! The flight controls are assembled.

Follow the wiring guide to wire up the sensors.

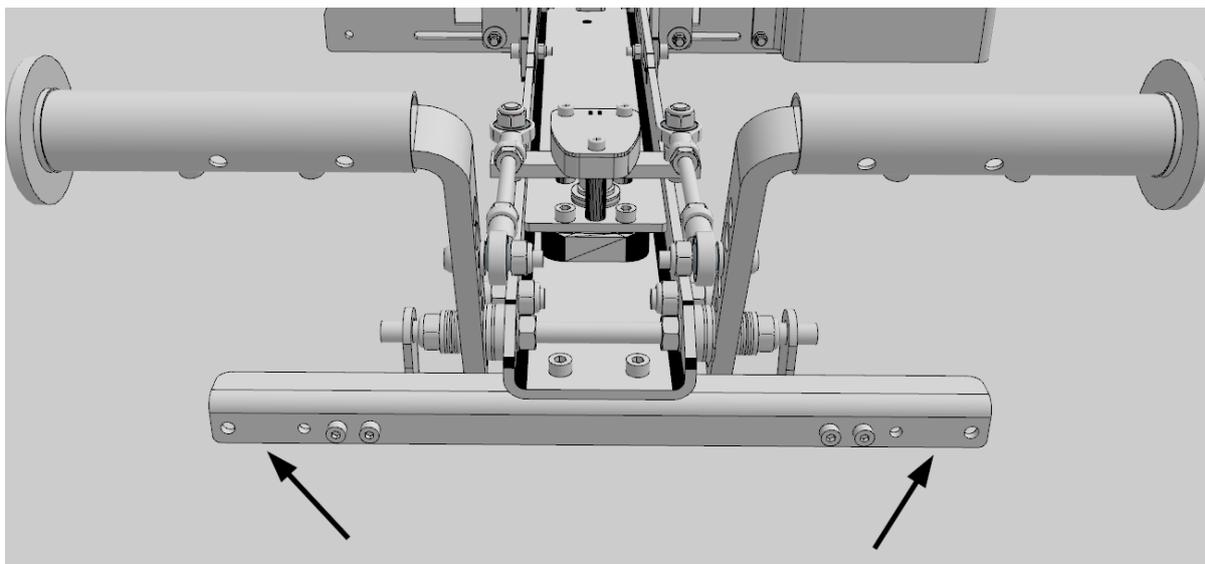
You might want to keep the remaining bears for later, or not, that's up to you!



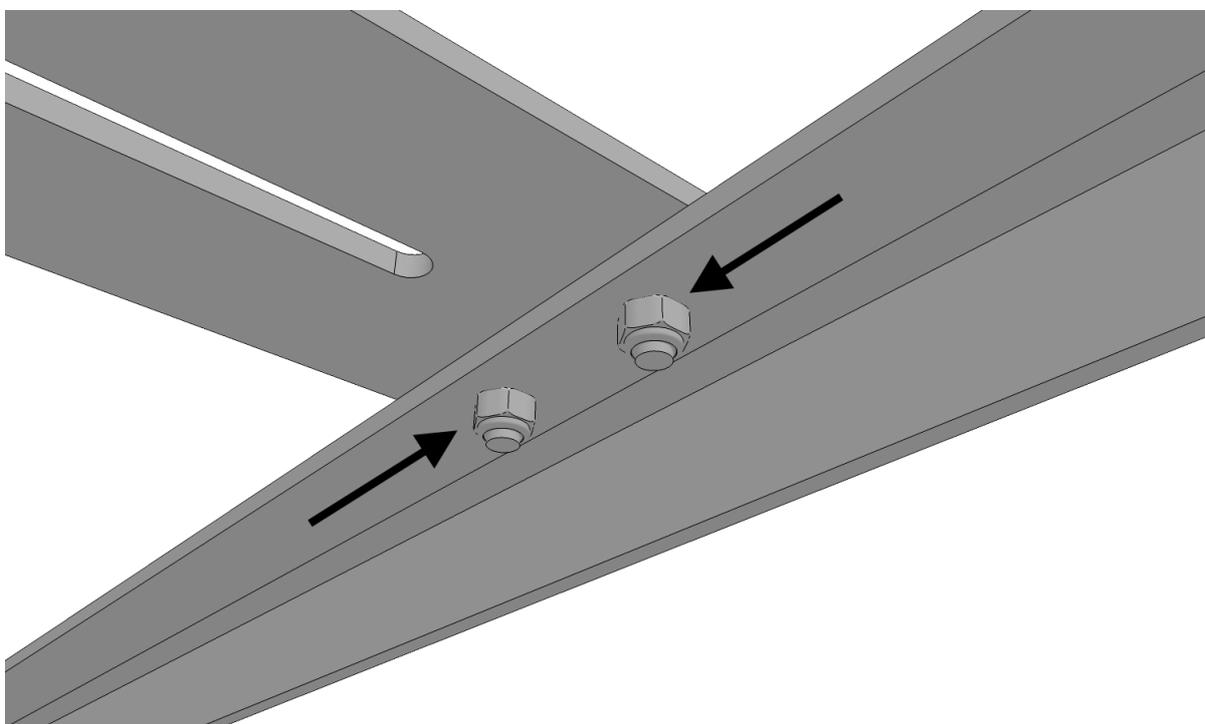
The PUMA X flight controls come with anti-slip feet that can be installed on all 4 corners of the frame as shown in the picture below.



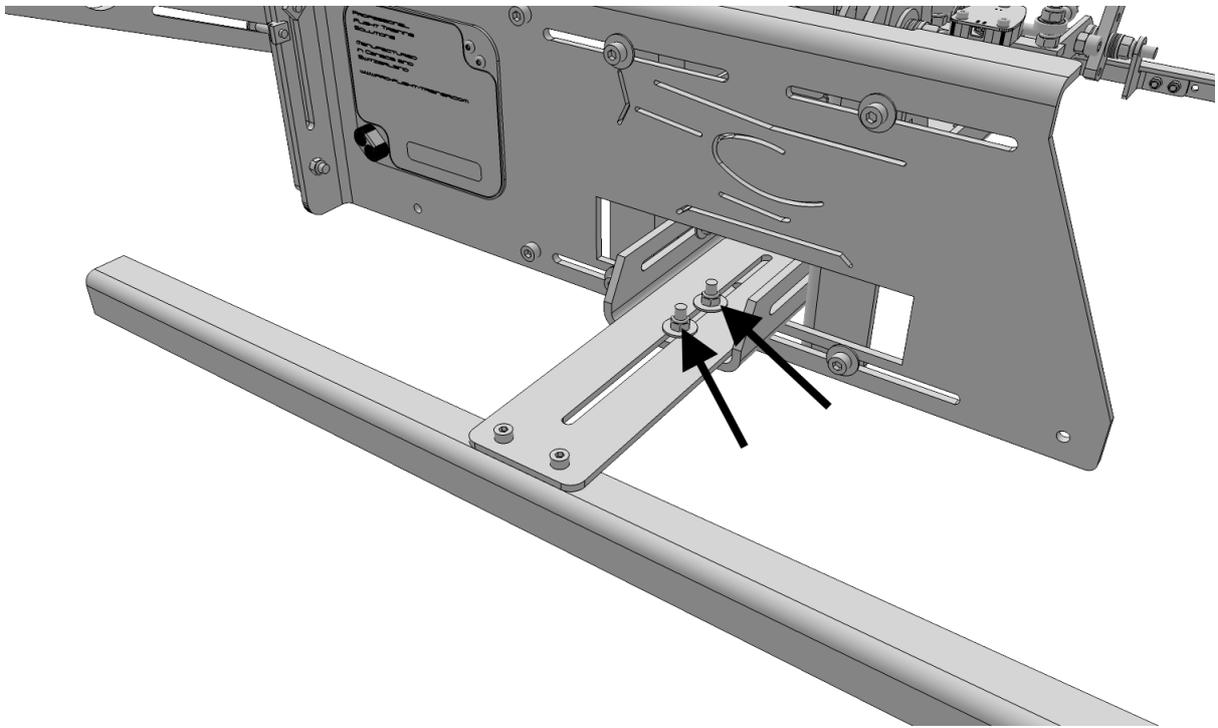
And at the front 2 shorter piece



In case the unit is used on a very slippery floor, or if you experience that the unit tends to move during usage of the pedals and brakes, you can add the seat blocker assembly to the frame.



Attach the seat blocker bar to the blocker plate using 2 screws



Attach the seat blocker assembly to the frame using 2 screws

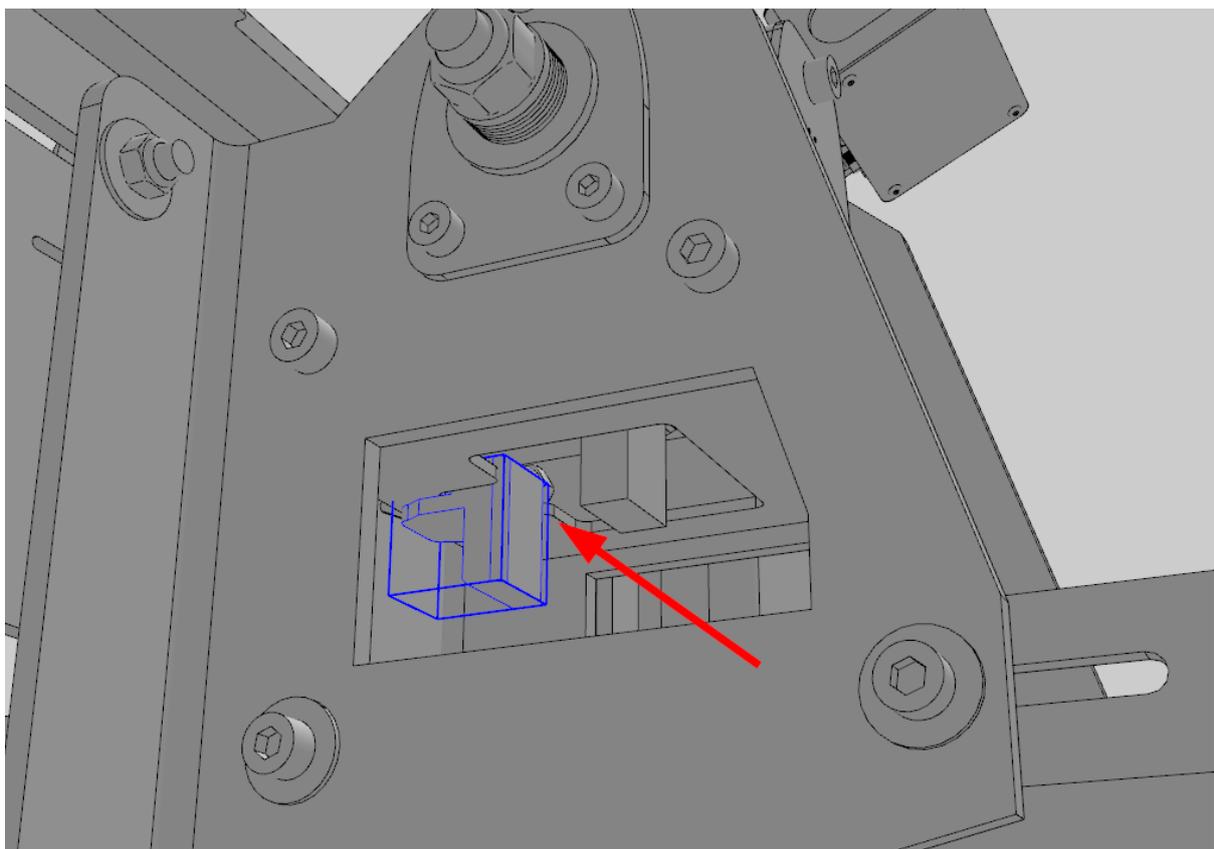
The Fold Stopper for the Cyclic assembly can be used to prevent the cyclic from going through the fold slot.

V1 is red or black



Start by bringing the cyclic into its upright position.

Insert the fold stop piece into the slot.

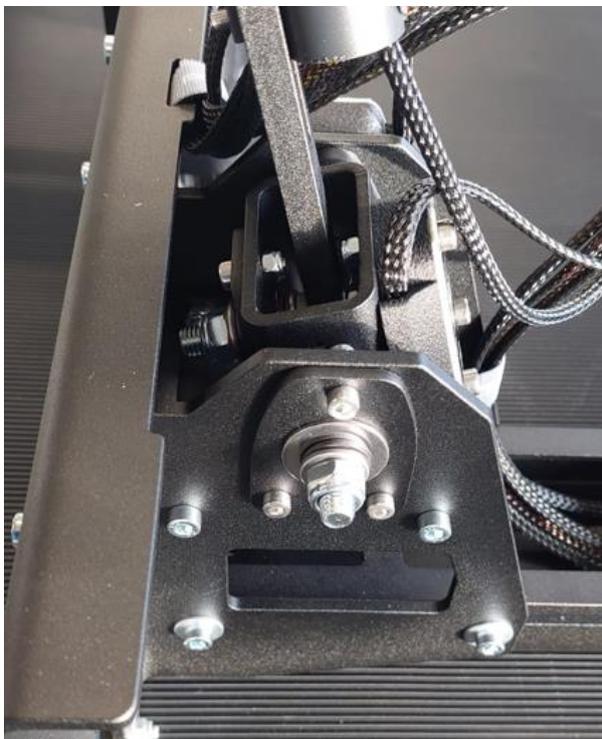


The fold stopper V2 is usually black

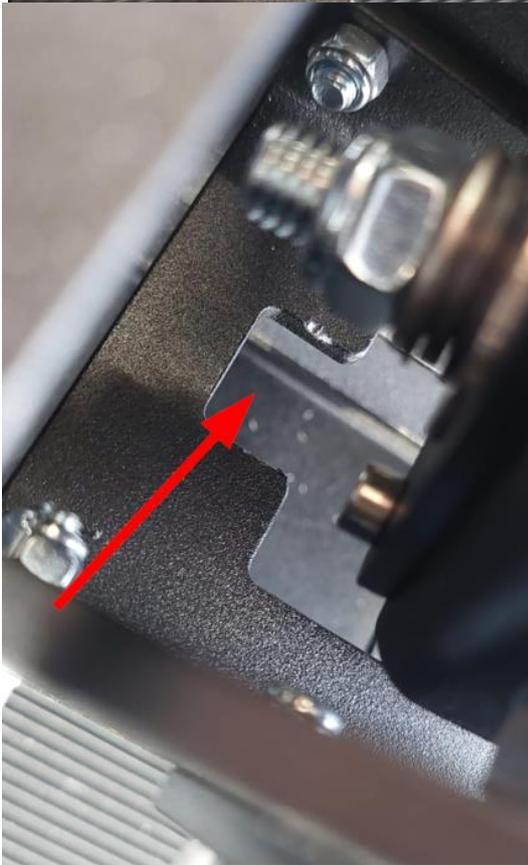
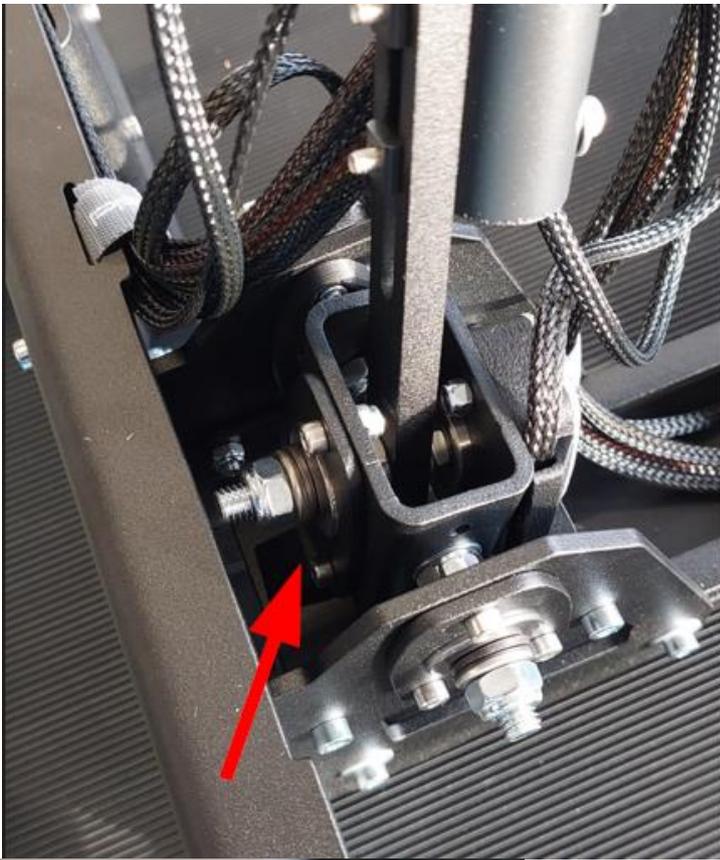


Installing the fold stopper V2.

Place the cyclic in the backward left position (towards the pilot and left)  
Orient the fold stopper as shown

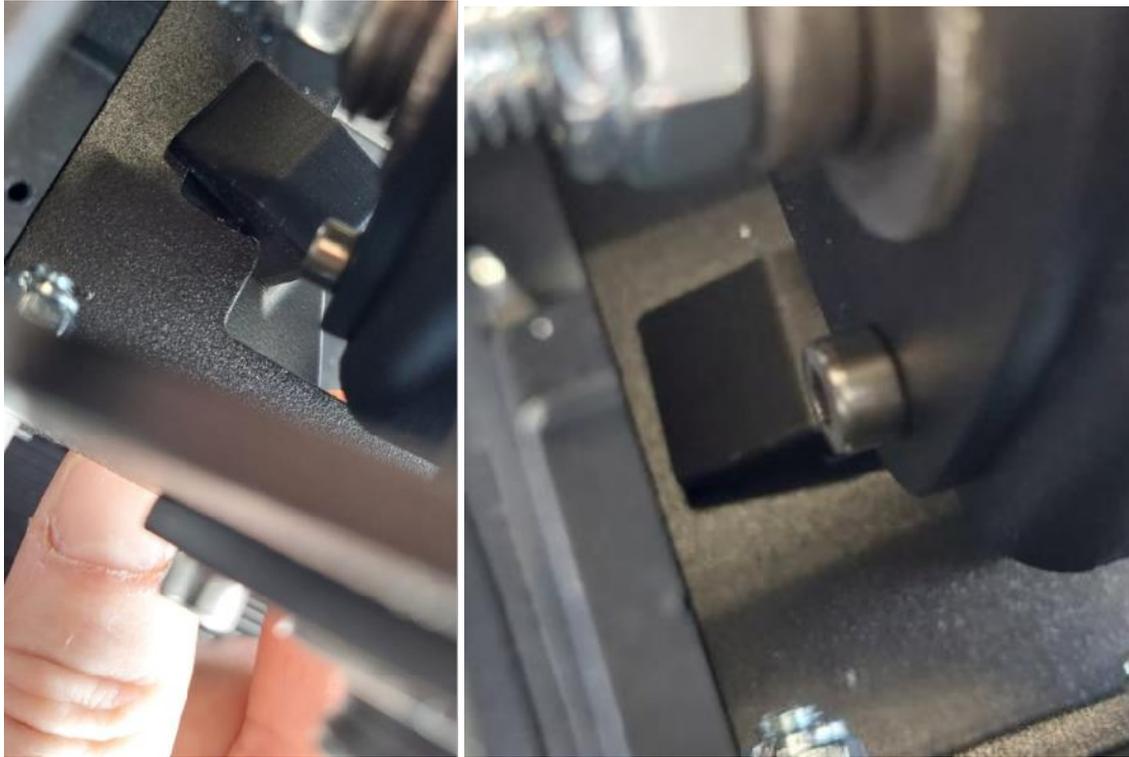


Locate the fold slot



Insert the fold stopper into the slot

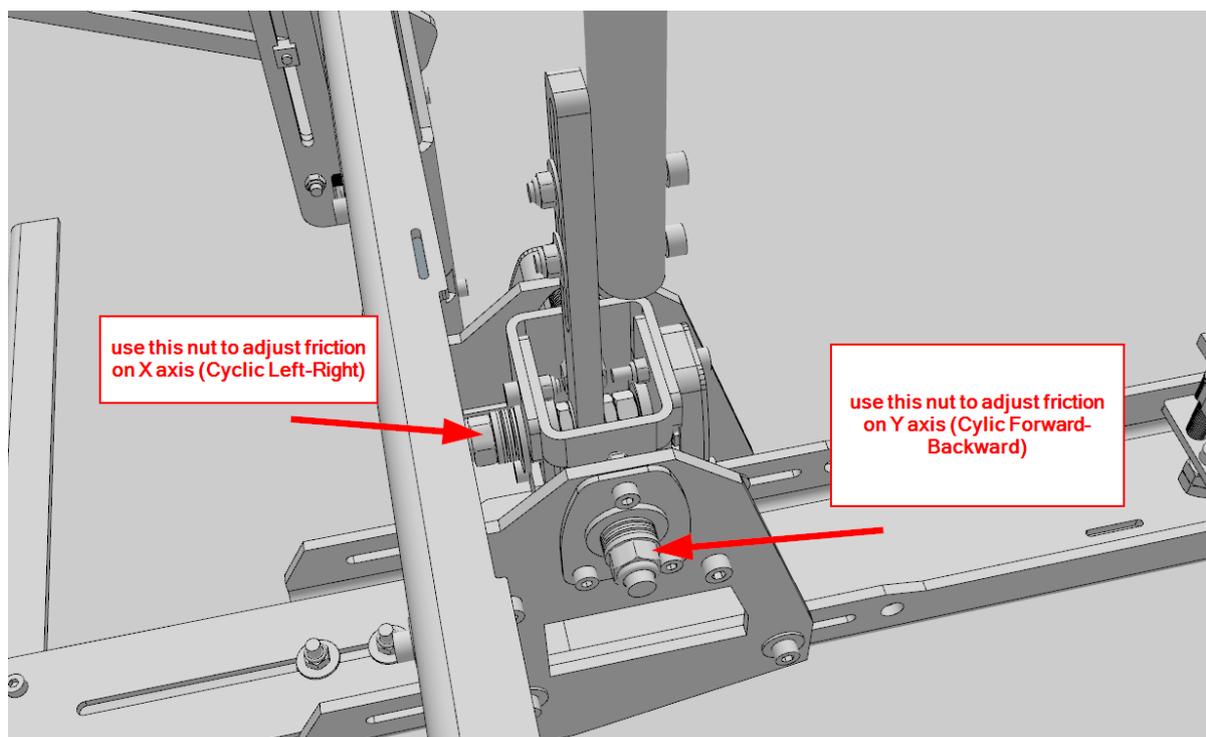
Once the fold stop is orientated and placed into the slot, move the cyclic forward and centre to push the fold stopper into position

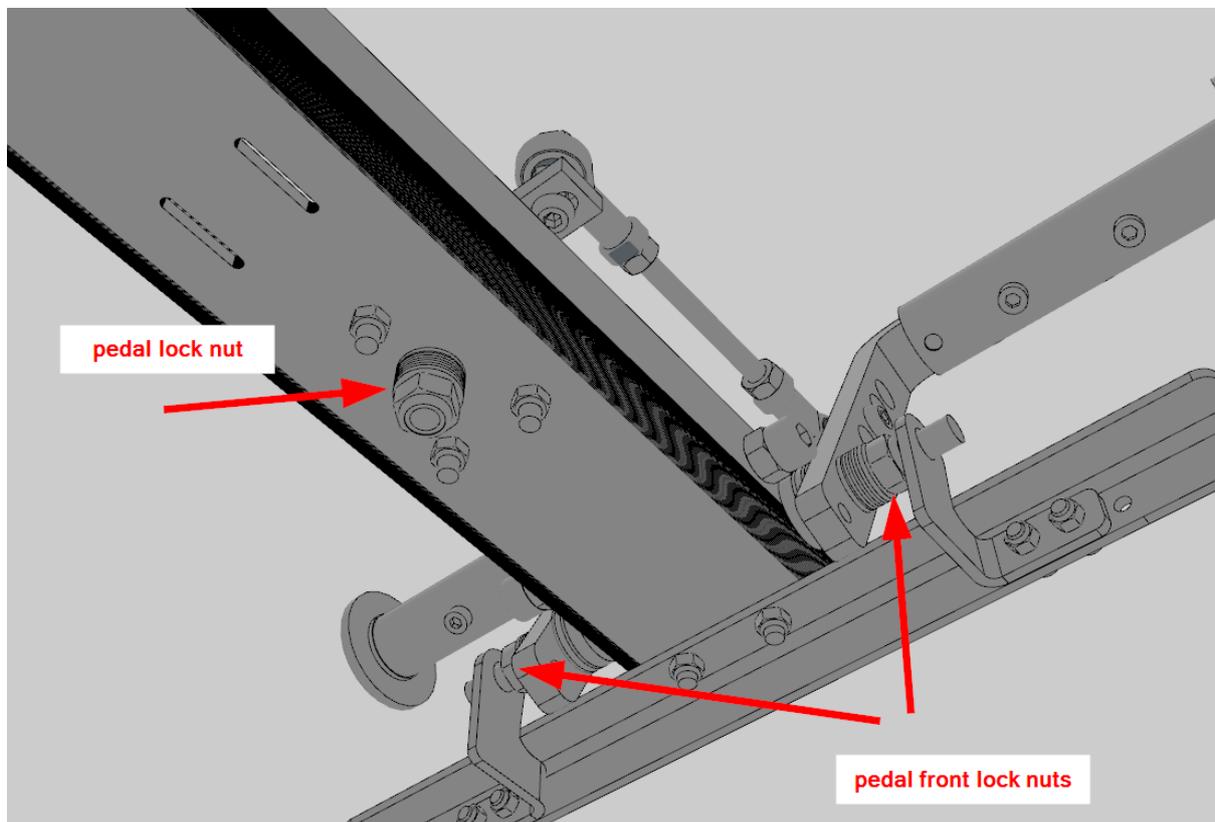


Mini-Wrench Nr 13 for quick friction adjustment (red or black)



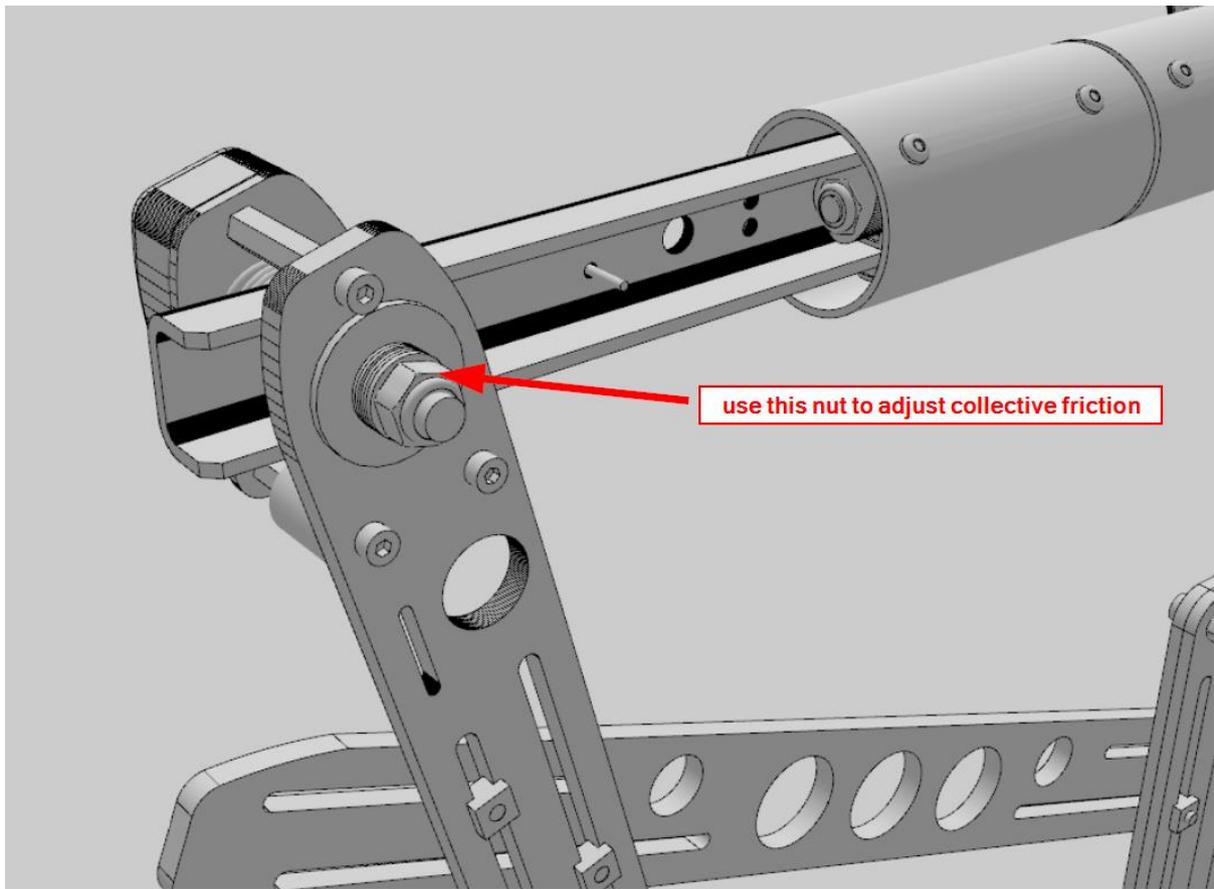
You can use this “mini wrench” to adjust friction on all 4 main axis “on the fly”.





Do not use the pedal lock nut to adjust friction! This might induce axis play. **Caution! Do not release the pedal lock nut such that the washers can freely move as this will create a play in the axis!**

You may release or tighten the pedal front lock nuts to decrease or increase pedal resistance.



Calibration wire, used for maintenance and special tasks



This special wire and connector set is only used under instruction of our support team, keep it somewhere safe! ;-)

The red toggle cover can be used on any of the 3 toggles. When flying VR, it can be helpful to have one of the top toggles covered in order to recognized immediately which one you are touching while flying (tactile feedback).

Small tube of silicon-based grease, used for friction washers and maintenance



The grease can be used to lubricate the washers used on the main 4 axis after long usage, or if you want to achieve very high level of friction on the cyclic axis (not recommended but possible)

Getting the friction right:

This little guide can help to find the “friction sweet spot”

It was written by a very experienced military helicopter flight instructor.

I have experimented with different friction settings, and I approach my adjustments in two different but similar ways to help me somewhat quickly change between control feels. Each method helps me adjust the cyclic feel for two types of helicopters, Light hydraulically boosted helicopters like the B206/AS350/H125, and another method for Heavier hydraulically driven flight controls and helicopters without hydraulic flight control systems. It is also important to note that with these methods I am using the metal washers that you sent me as well as lubricating the metal washers with silicon oil. I started using the oil after finding that my cyclic

will squeak when used at higher friction settings, the added benefit was smoother cyclic movements at friction settings that closer resembled the aircraft I normally fly in real life. I mention this because this might not be necessary for most users. the Cyclic feel of an AH-64 is different from a R44, so most people will not need frictions set that high.

for light hydraulically boosted helicopters, I start with no friction, and then tighten it to where the flight controls hold their position when moved and do not flop all the way over to the stop. From there, I will add one half to one full turn of the nut. That is my base adjustment and I make smaller incremental adjustments from there until it feels right.

for heavier helicopters or non hydraulically driven/boosted models. I do the opposite. I tighten the until the controls do not move easily. I do not have a pull gauge, but i measure this by using two fingers and pressing on the cyclic in pitch and roll with my fingertips. my fingers should give and bend backwards before the cyclic moves. and it should be a smooth movement, the cyclic should feel like it has "broken free". from there I will make smaller adjustments to get it "just right". I also use this method on my pedals. mostly because the AH-64 has force trim in the pedals, and large "feel springs" that offer a lot more resistance than that of a 300 or any of the Robbies.

I have found these give me the best results, while short of some sort of mechanical control load/ force feedback (Which

would be awesome by the way) it also doesn't address any sort of force trim, which again is a mechanical thing, but get's me close enough to be beneficial. Again, most of my adjustments are made to emulate what I fly on a regular basis, but it might be a useful technique for others.