

MECHANICAL DESIGN OF

# Haptic Pantograph

LOW COST GROUP

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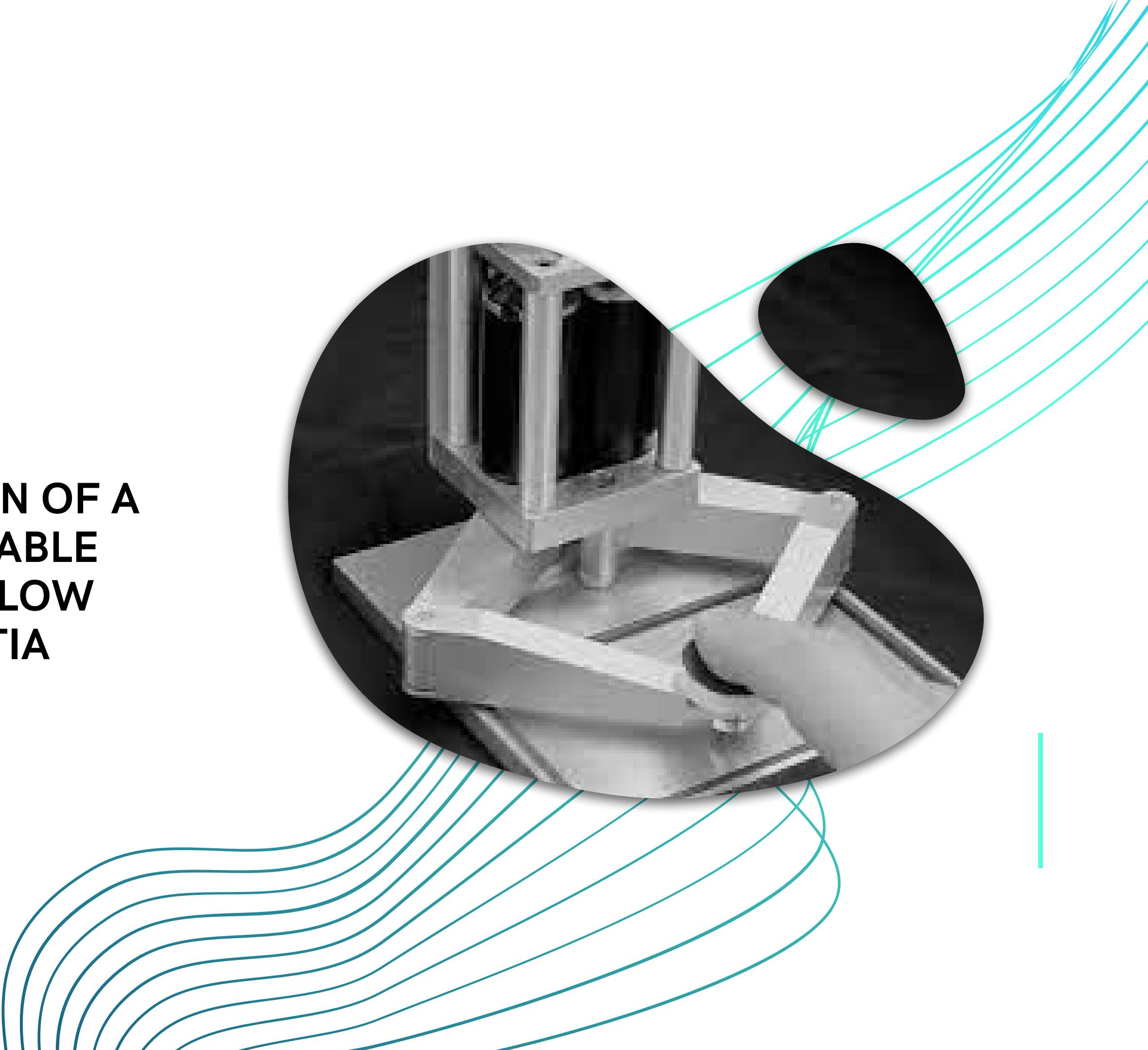
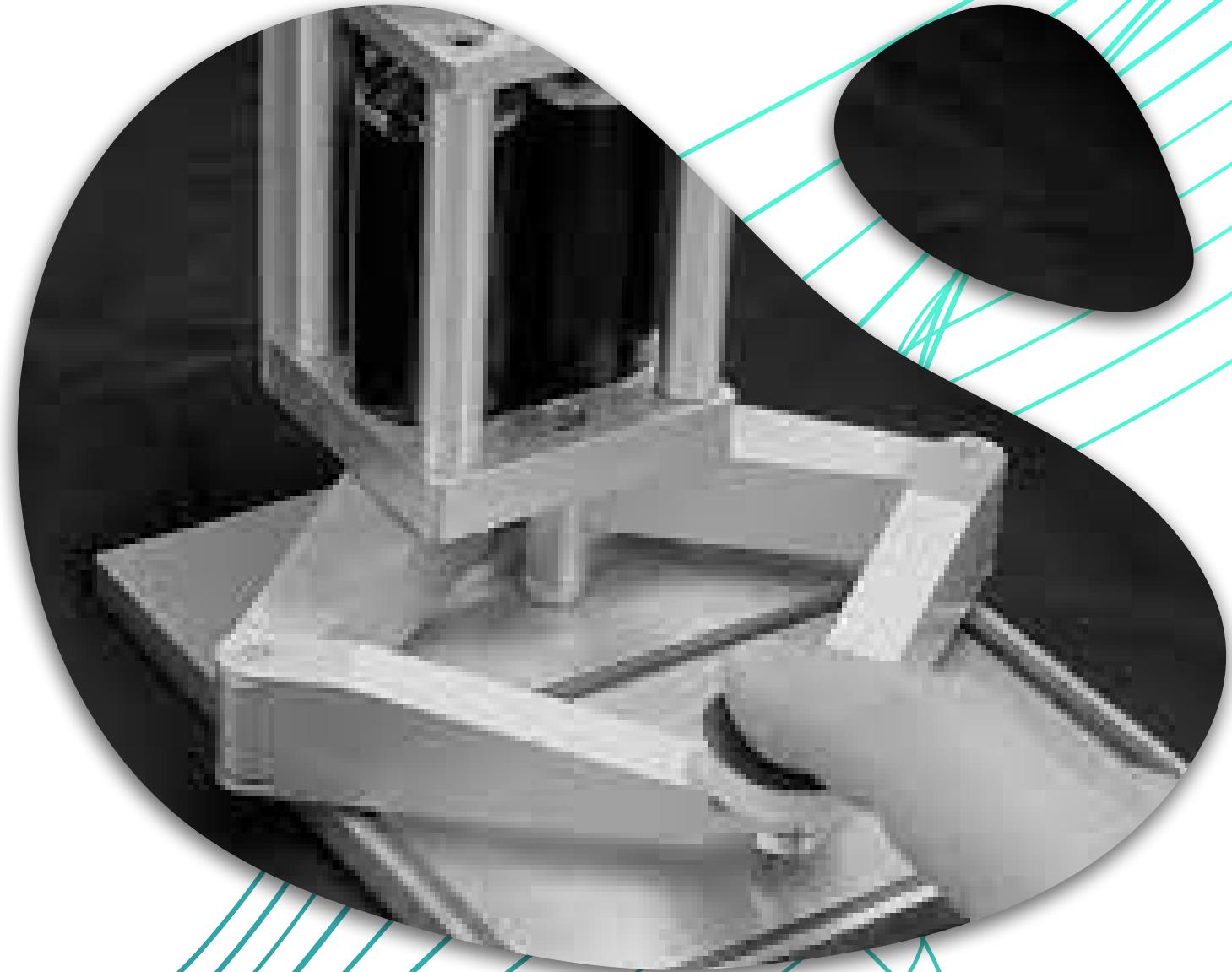
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# Introduction

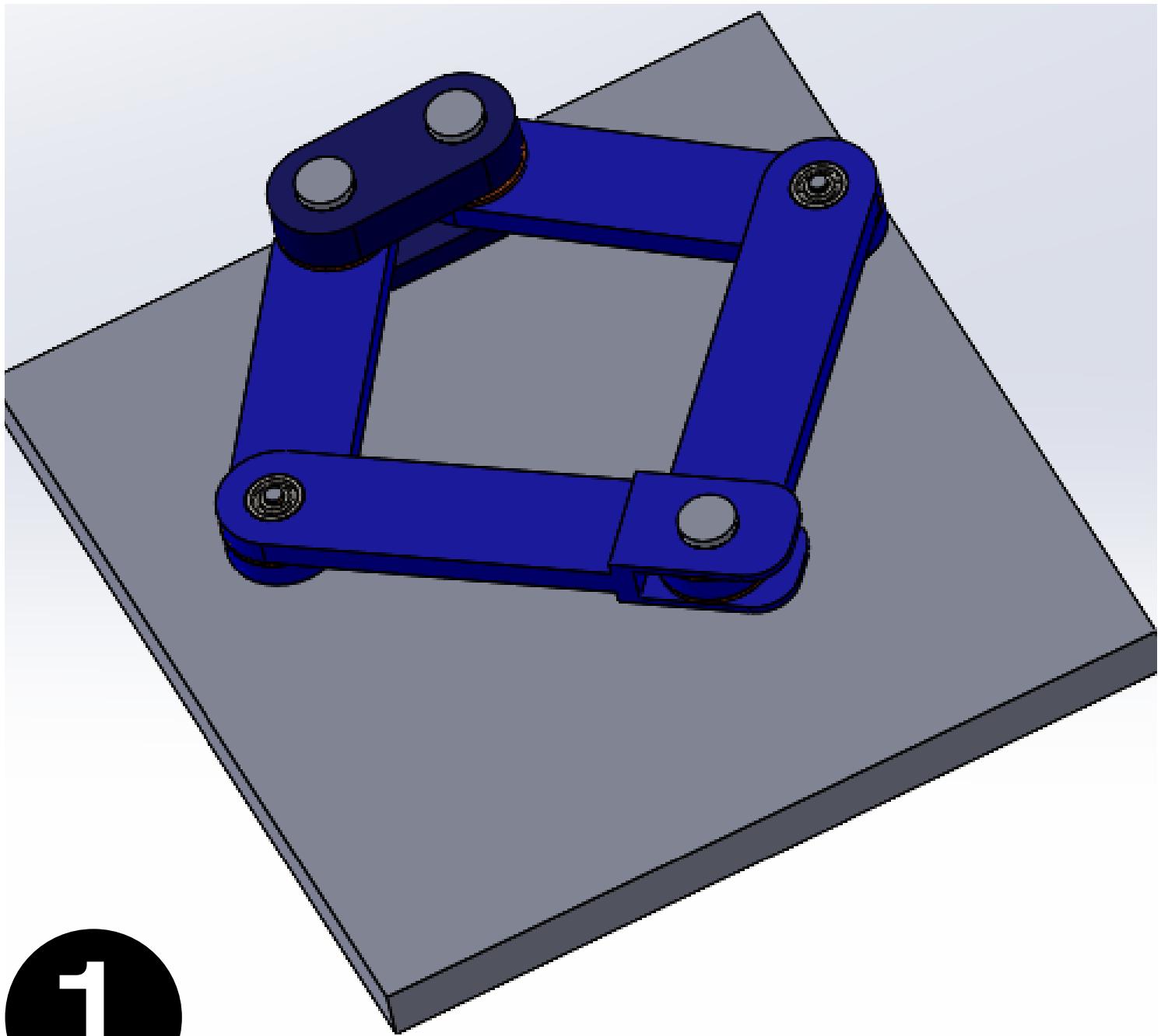
## OUR OBJECTIVE :

THE MECHANICAL DESIGN OF A  
LOW-COST BACK DRIVABLE  
HAPTIC DEVICE WITH LOW  
FRICTION AND INERTIA

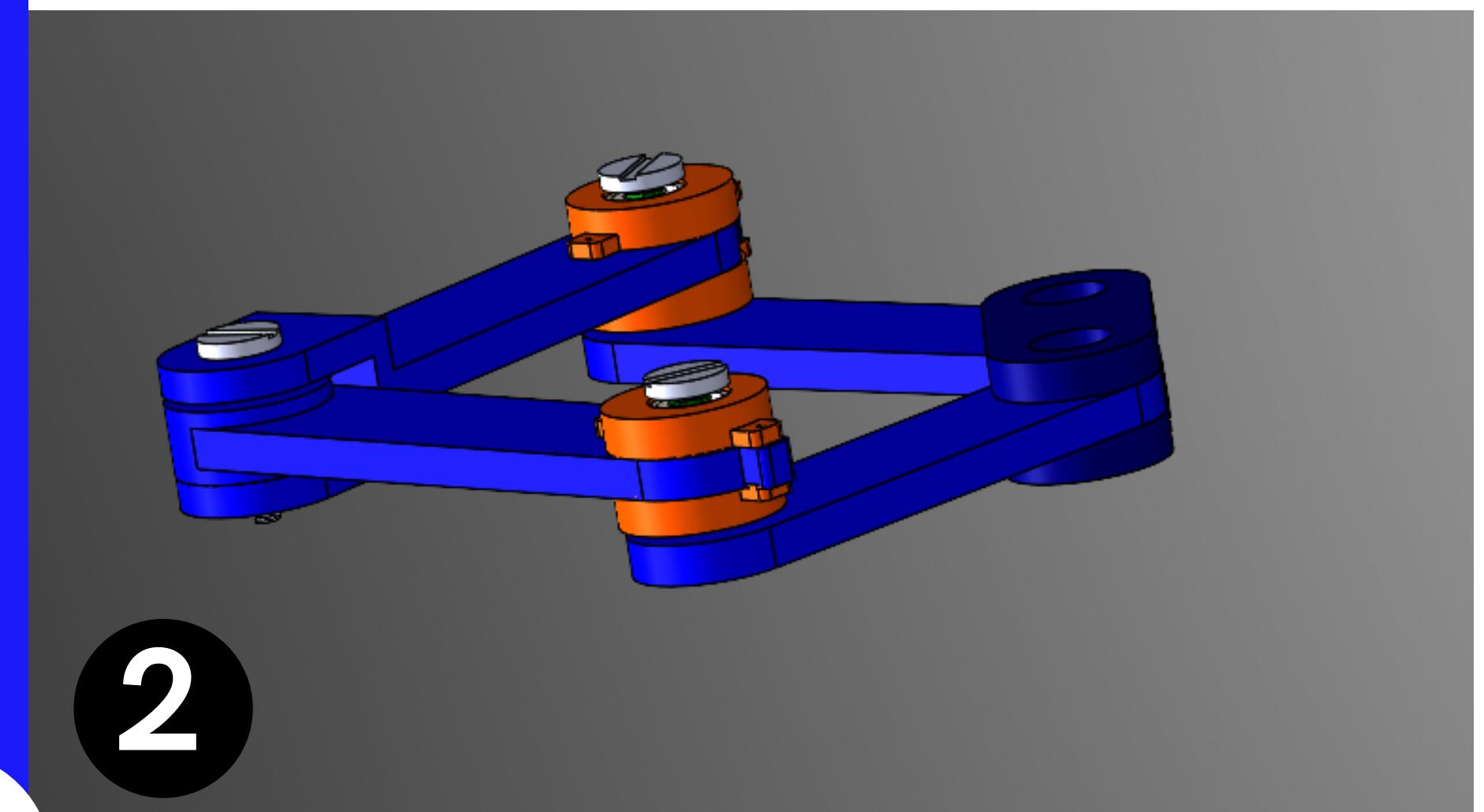


# Project Evolution

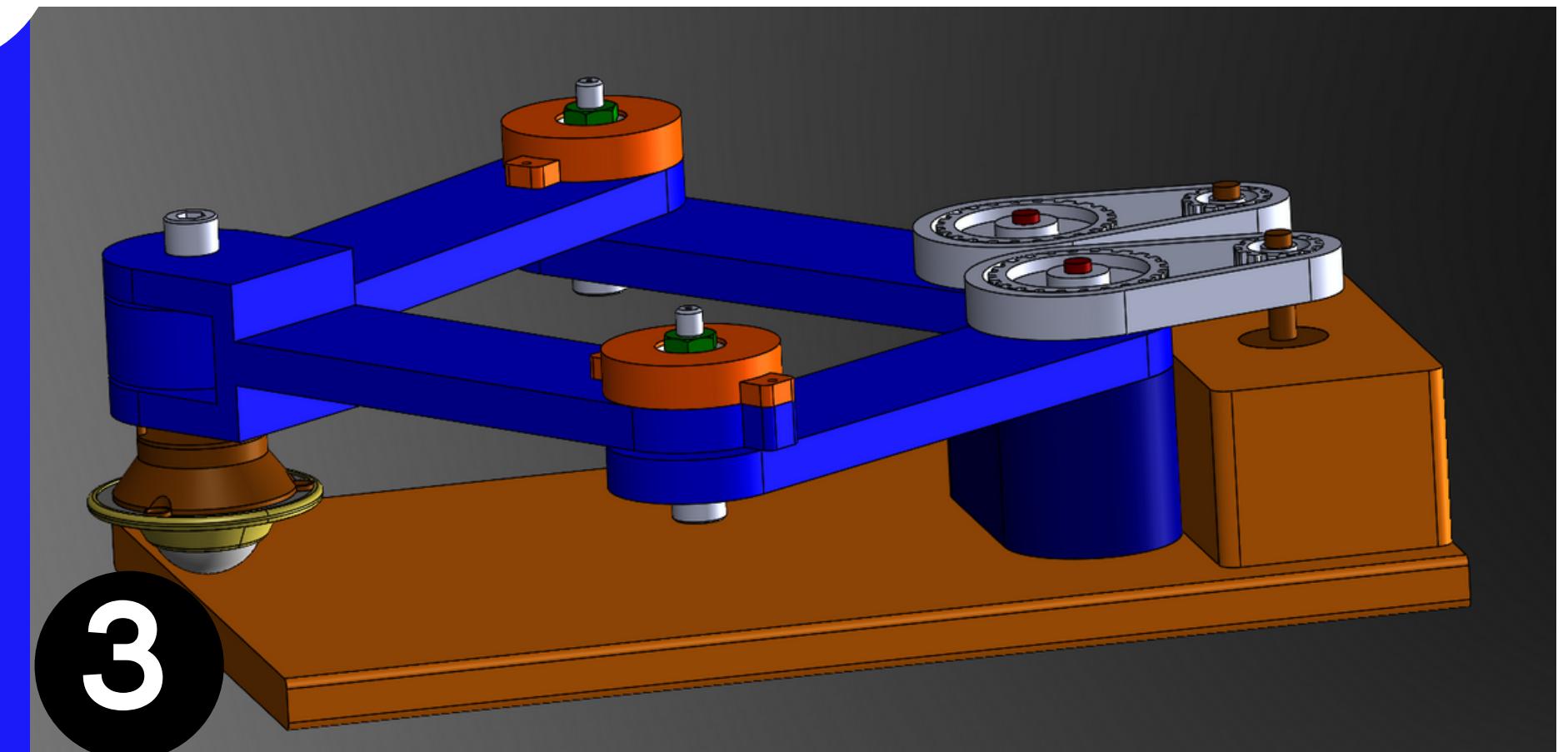
- Iterative Process



1

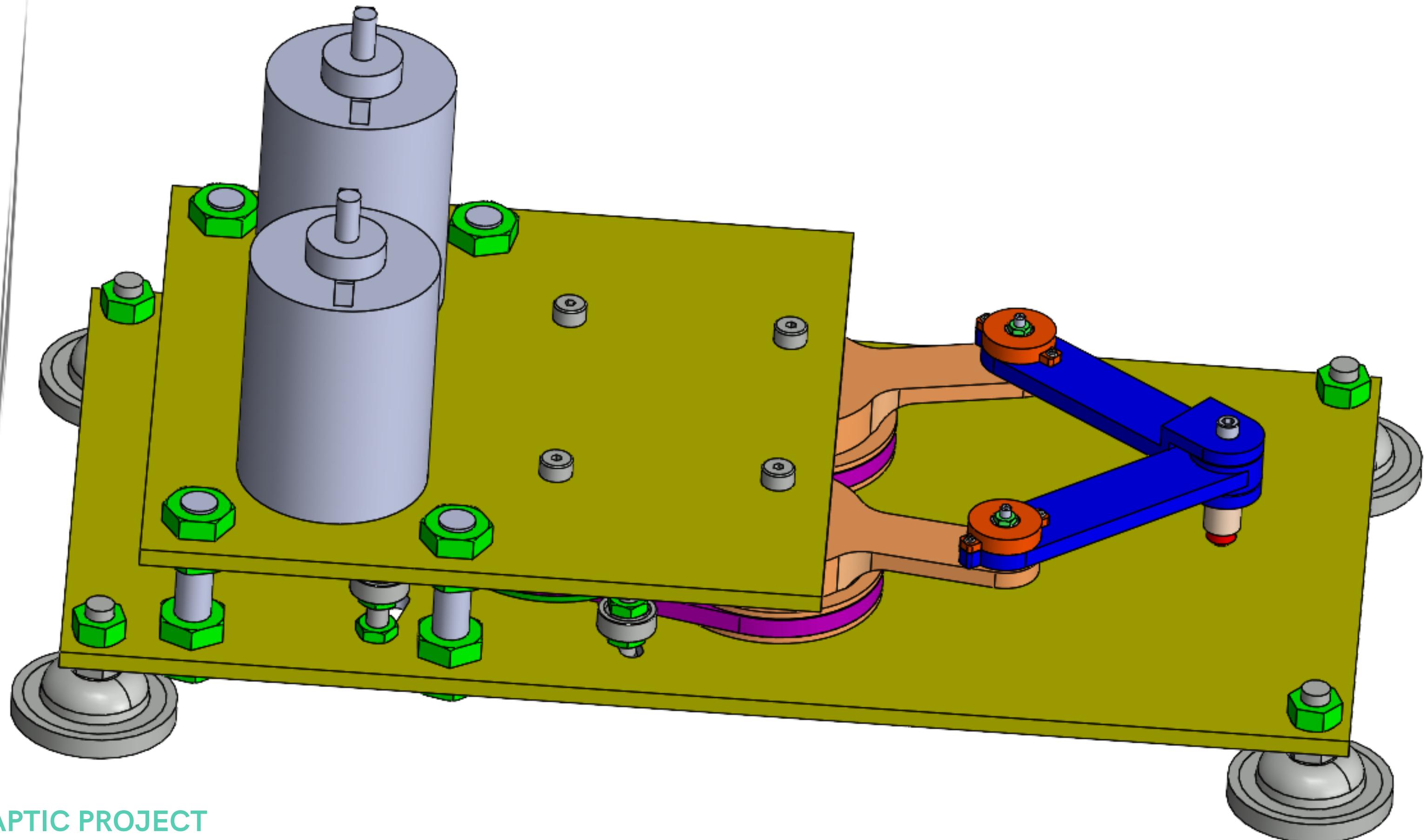


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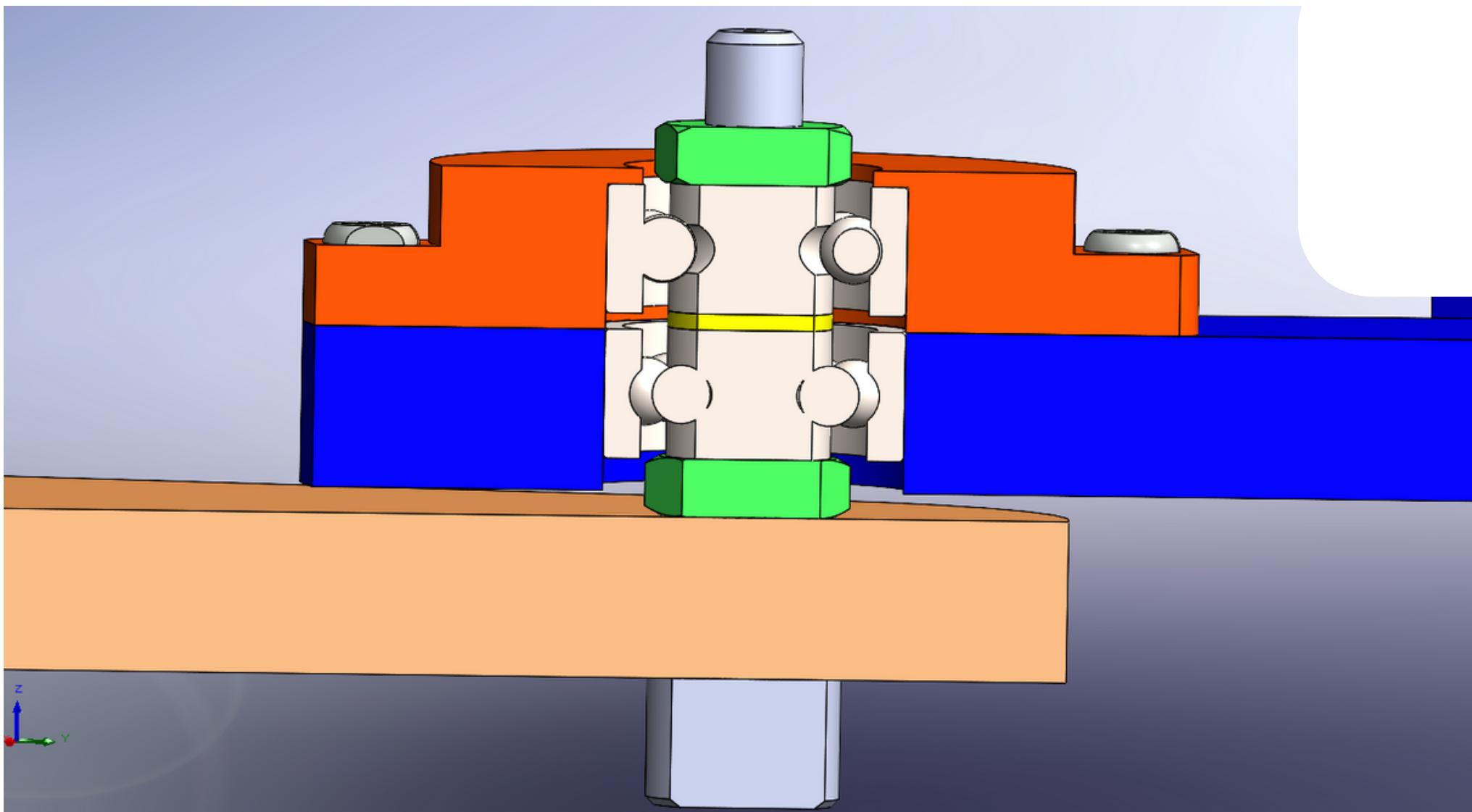
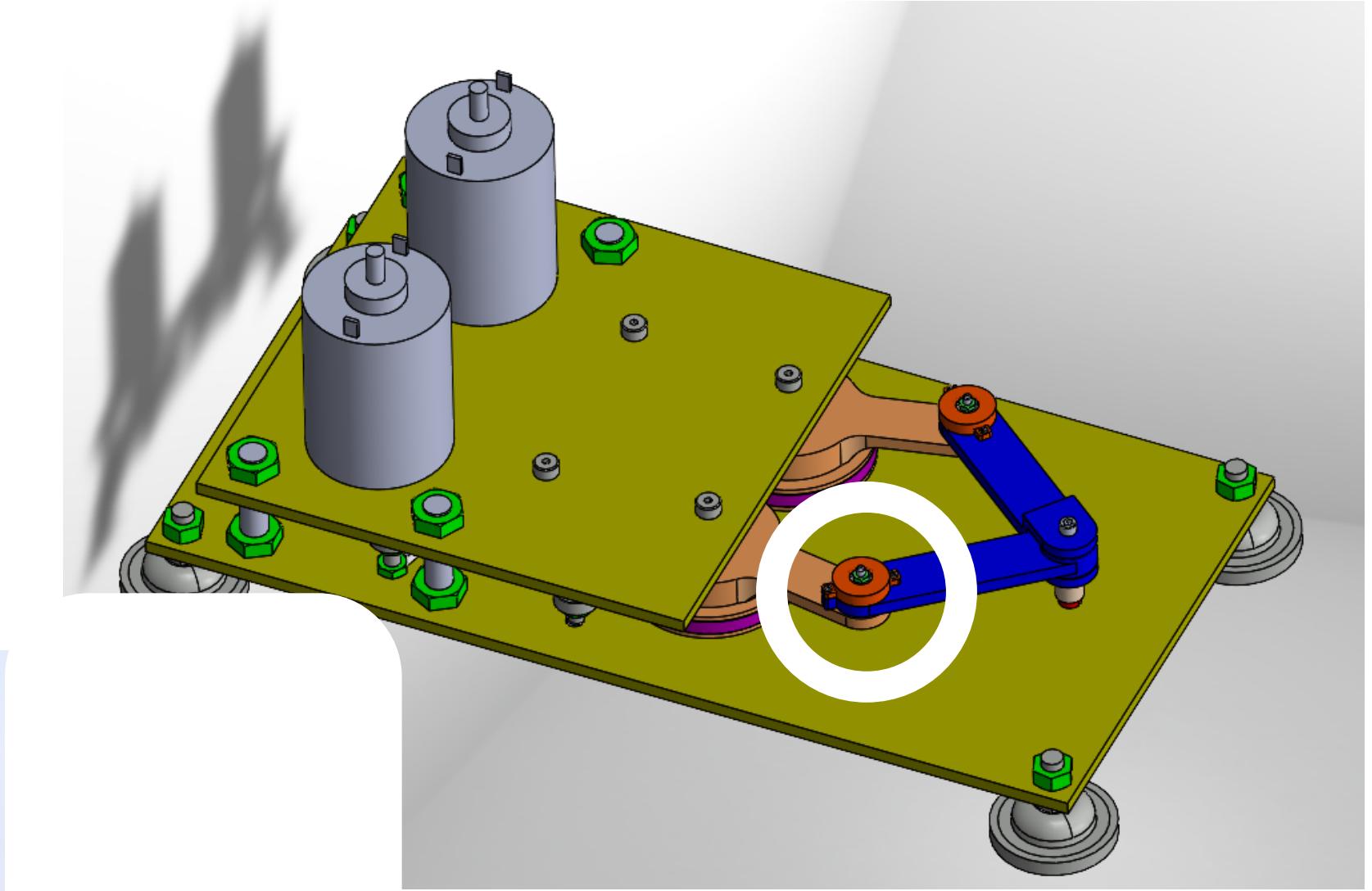


3

# Final model



# DETAINED CUT VIEW - ARM



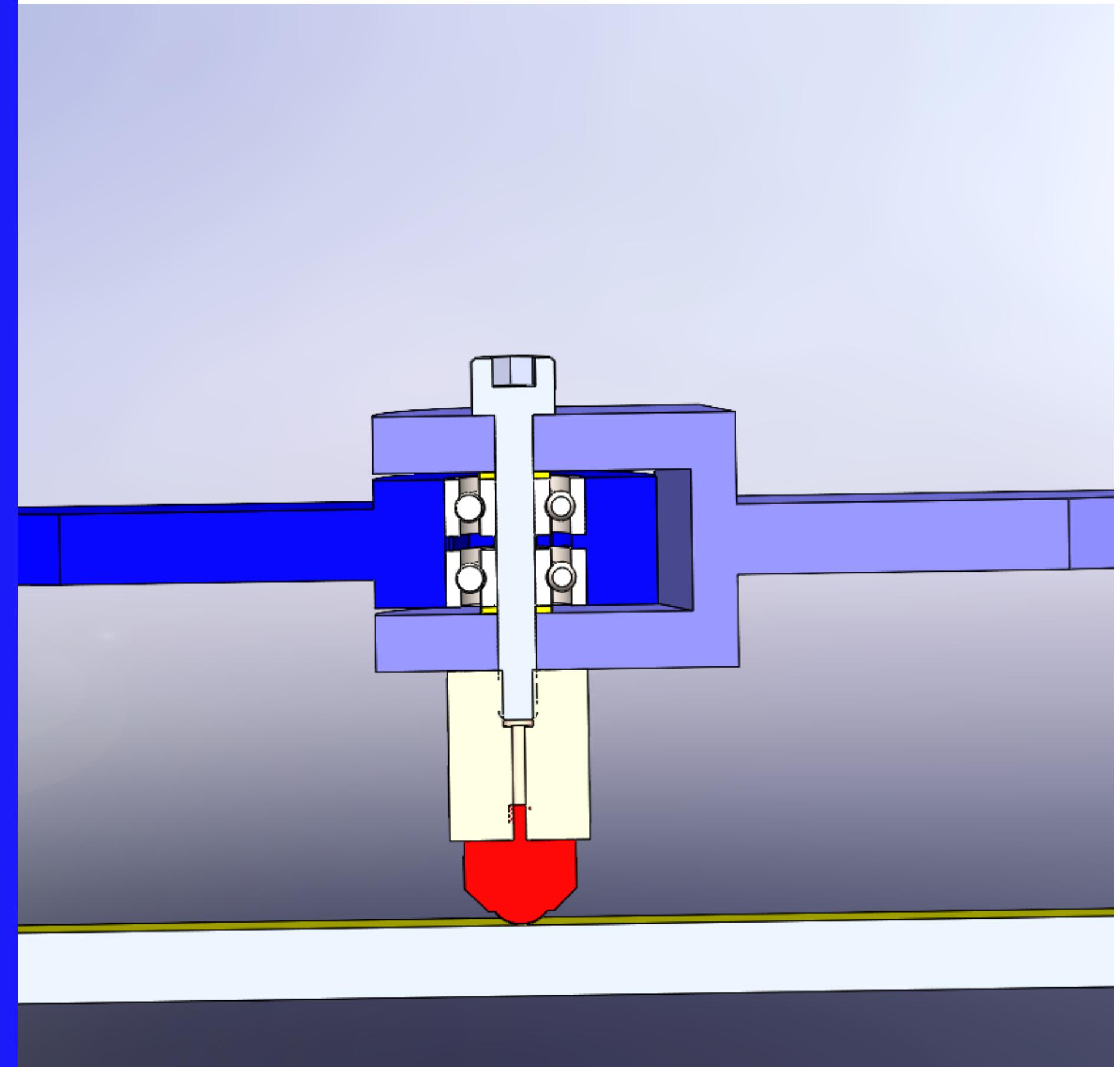
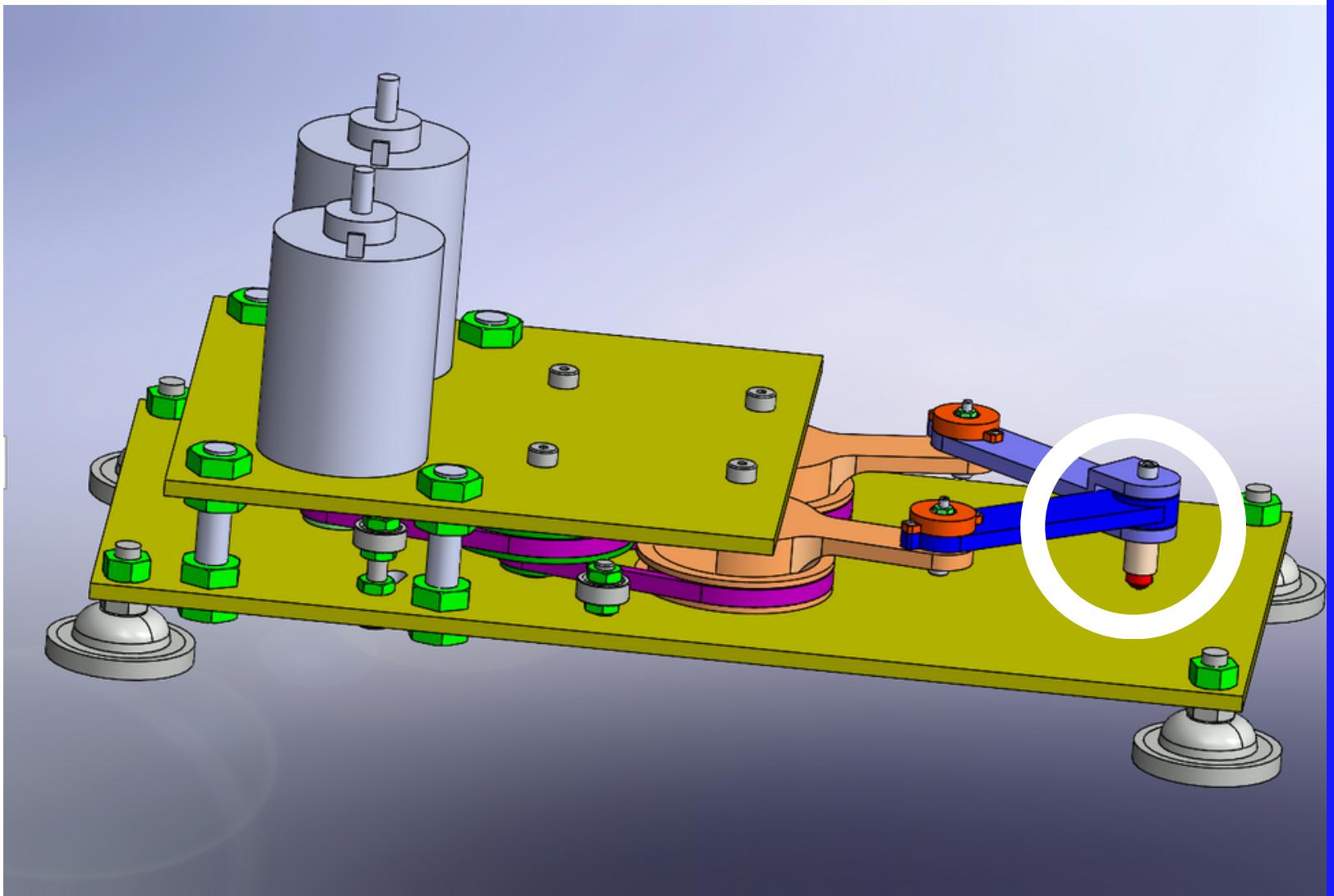
## LINKAGE

- Pivot (Ball bearing)

## AXIAL STOP

- Shoulder and spacer

## DETAILED CUT VIEW - FORK & EYE



### LINKAGE

- Pivot (Ball bearing)

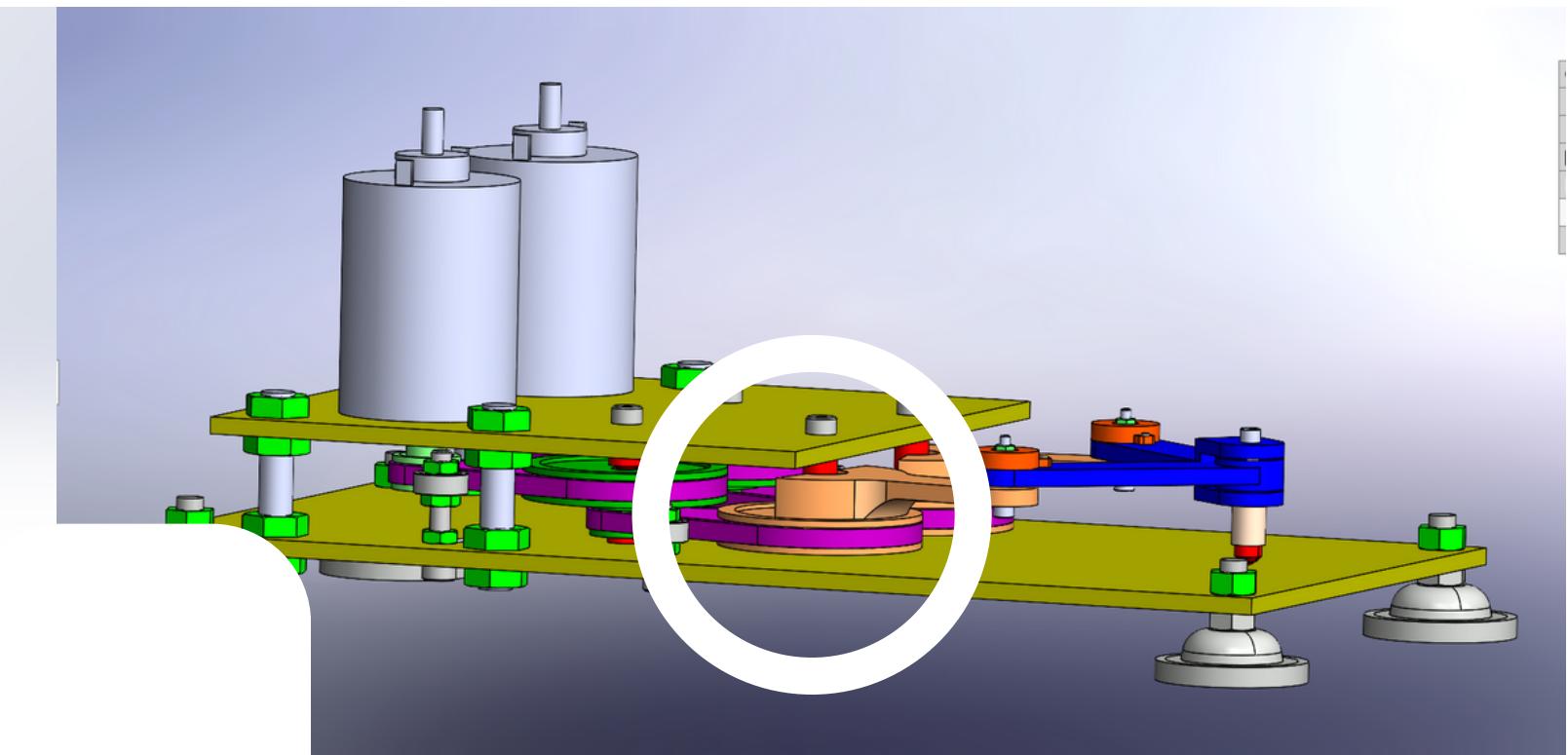
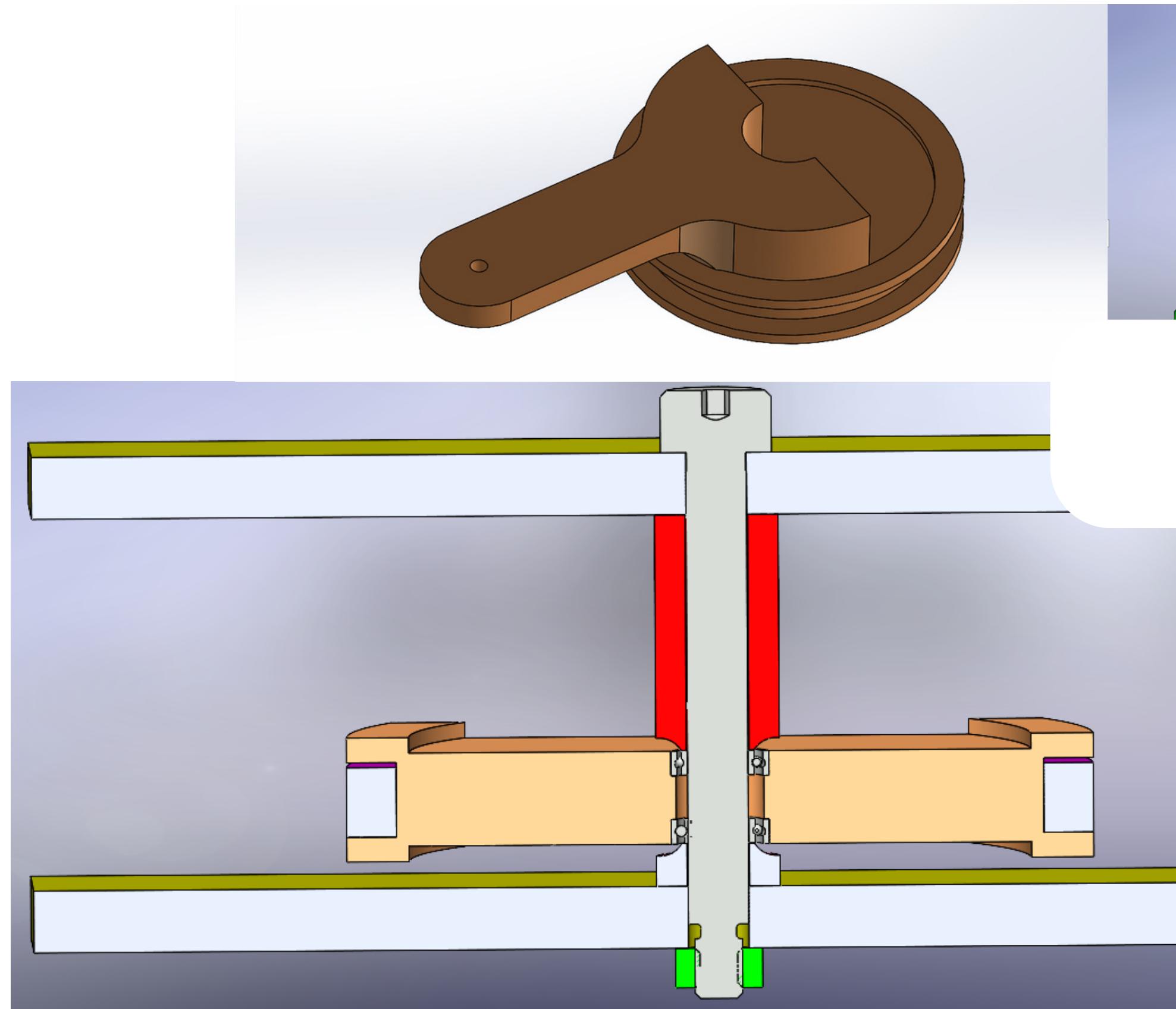
### AXIAL STOP

- Shoulder and spacer

### SUPPORT

- Ball transfer unit

# DETAINED CUT VIEW - PULLEY



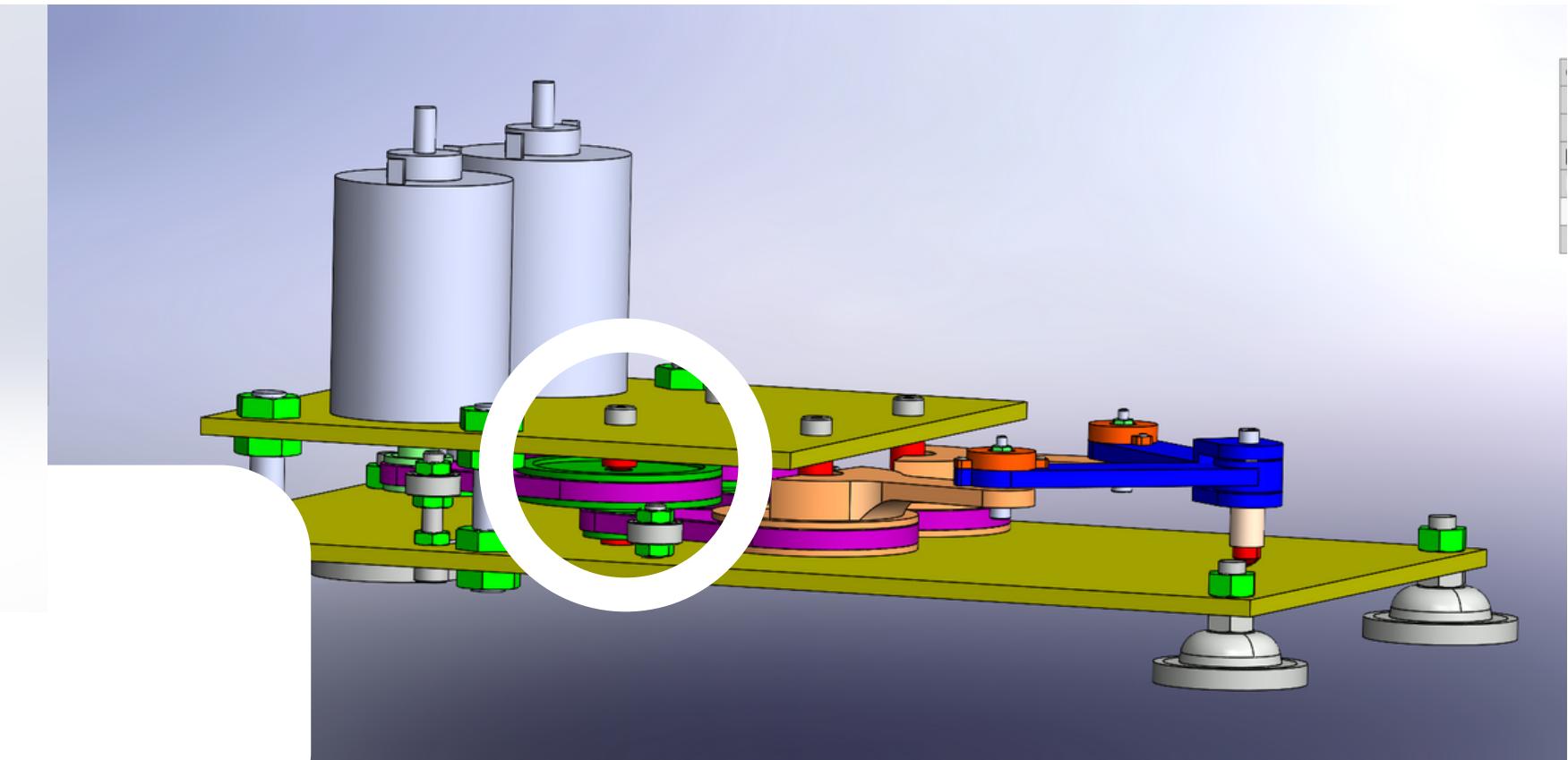
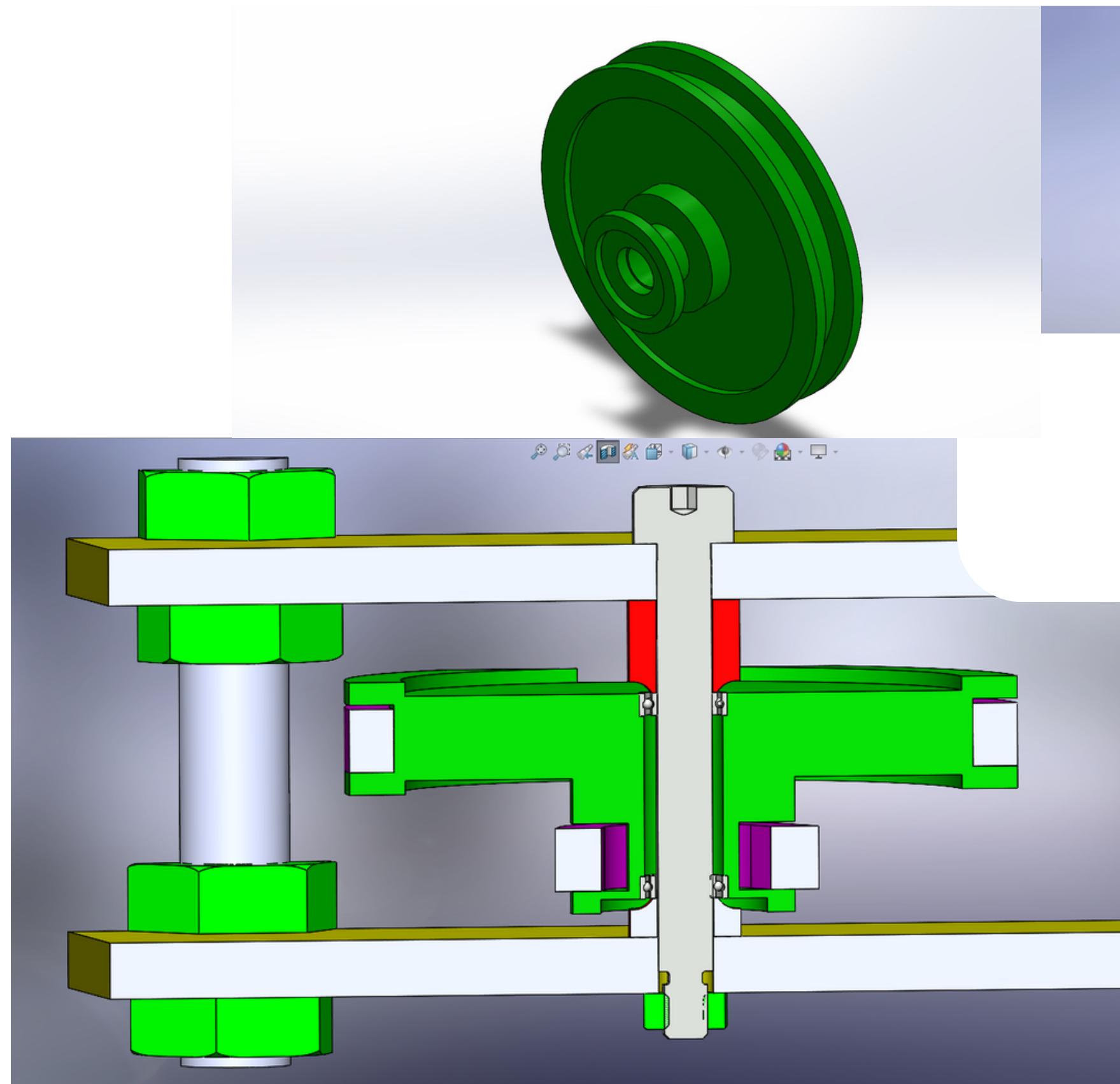
## LINKAGE

- Pivot (Ball bearing)

## AXIAL STOP

- Shoulder and spacer

# DETAINED CUT VIEW - COMBINE PULLEY



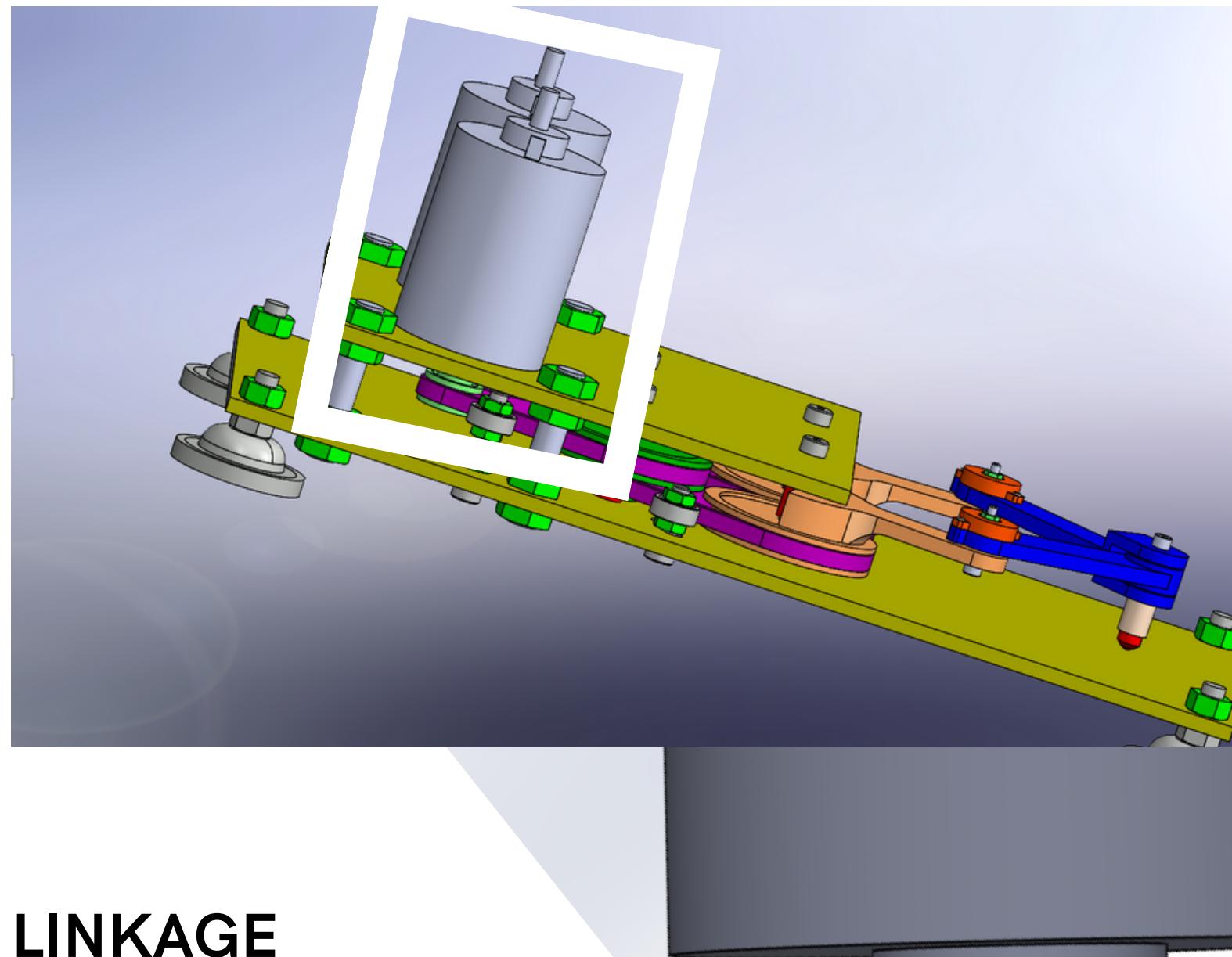
## LINKAGE

- Pivot (Ball bearing)

## AXIAL STOP

- Shoulder and spacer

## DETAILED CUT VIEW - MOTOR DRIVE

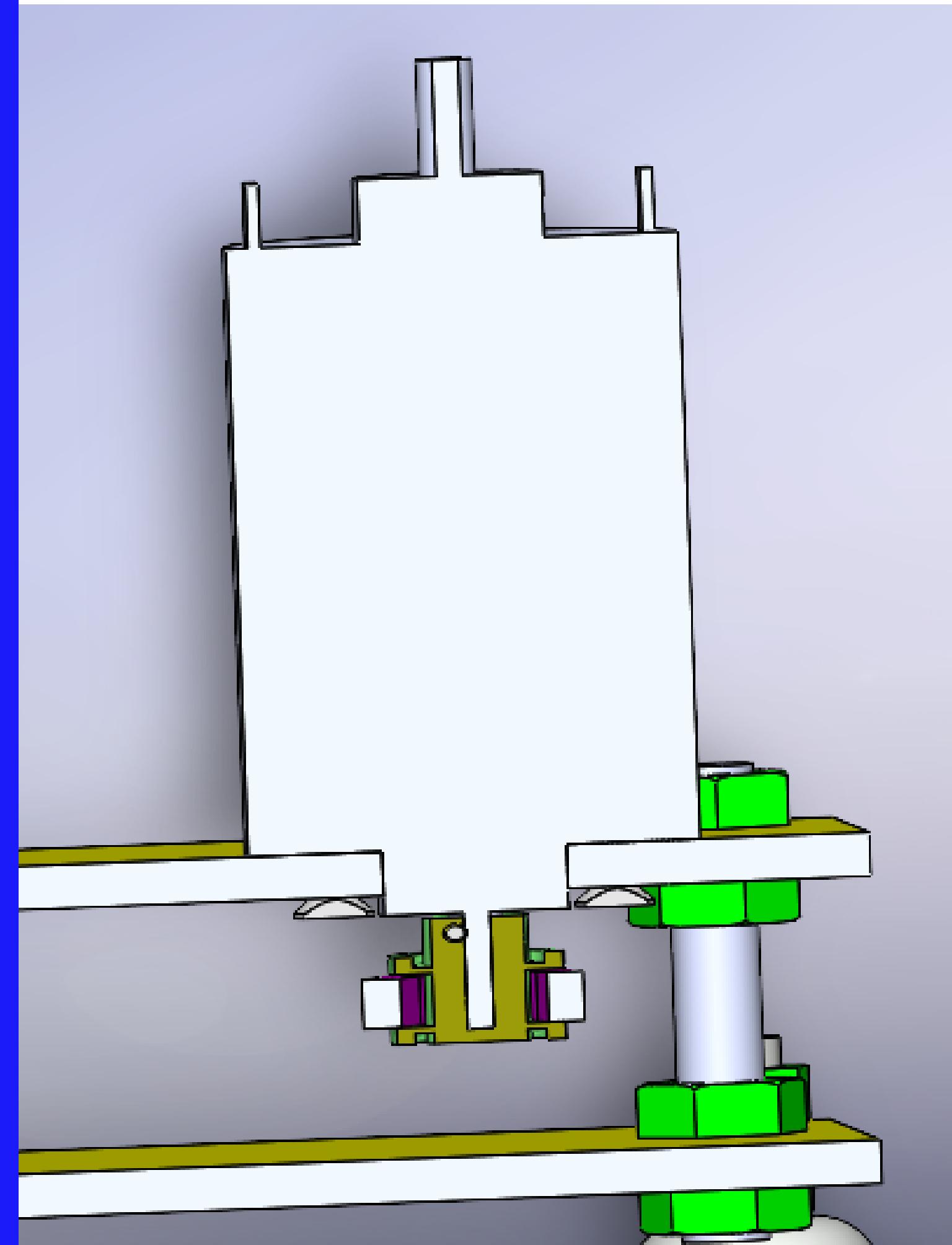


### LINKAGE

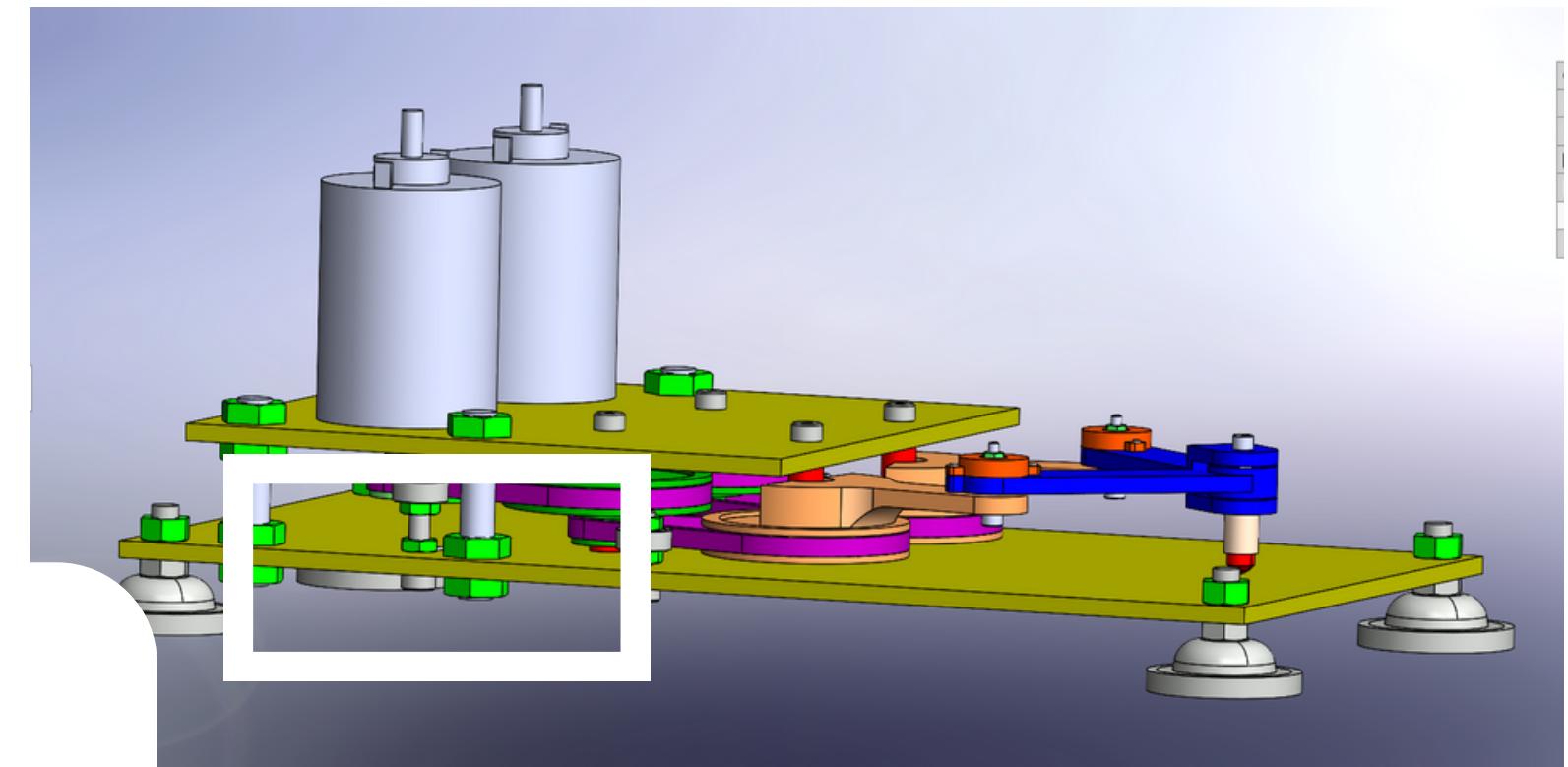
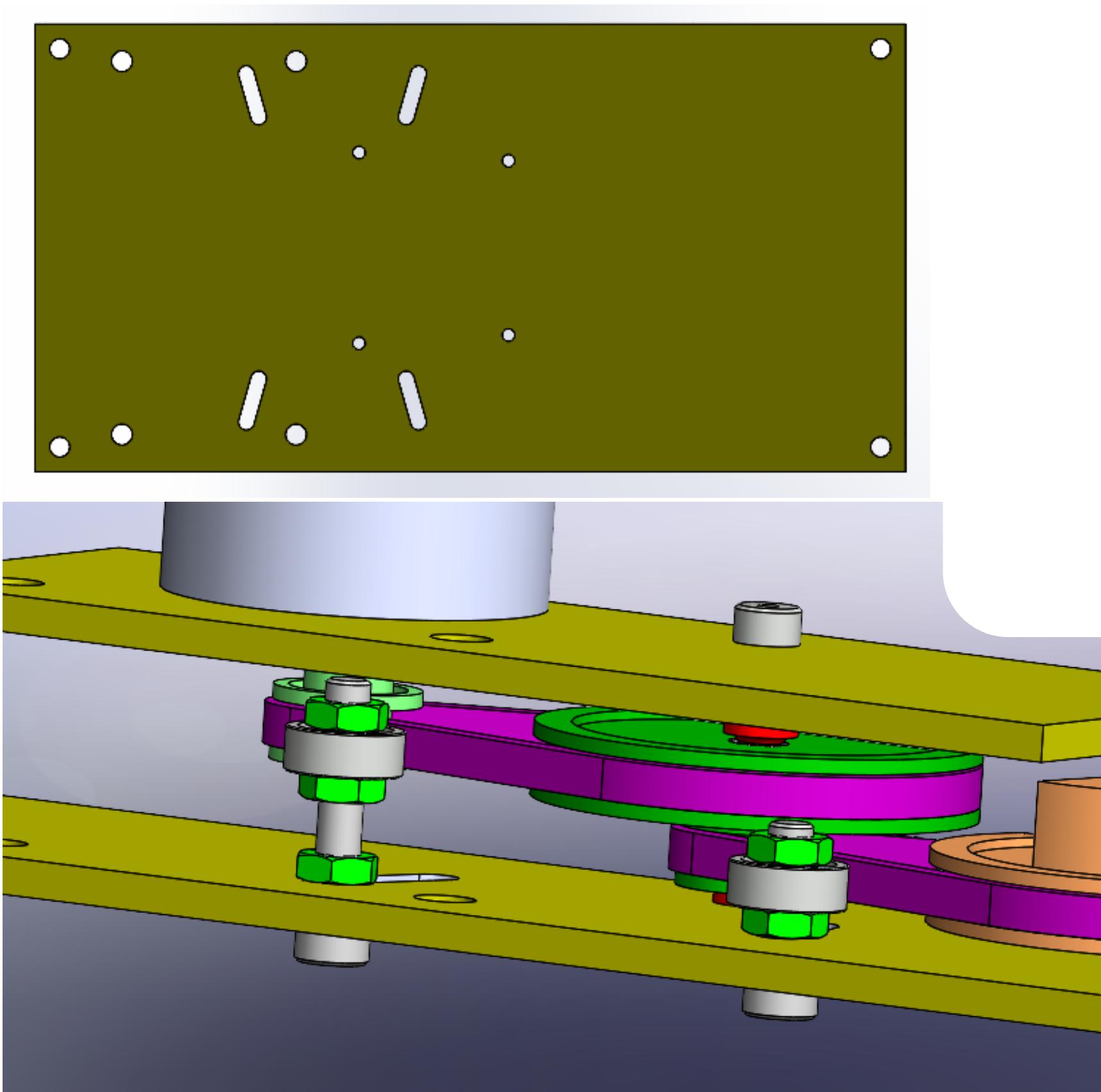
- Pivot

### AXIAL STOP

- Shoulder



# DETAINED CUT VIEW - TENSION SYSTEM



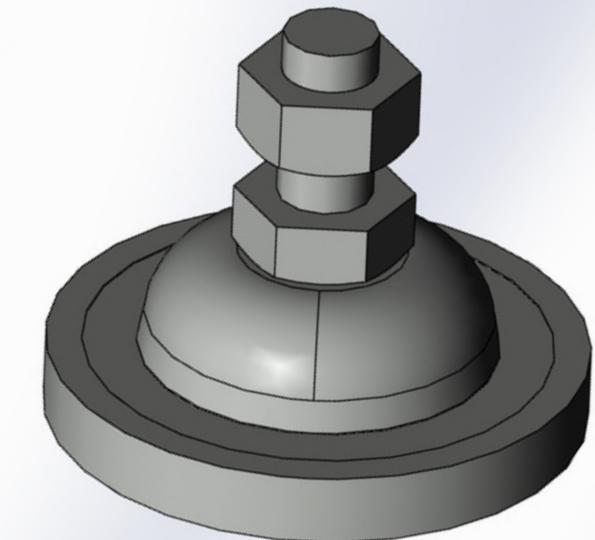
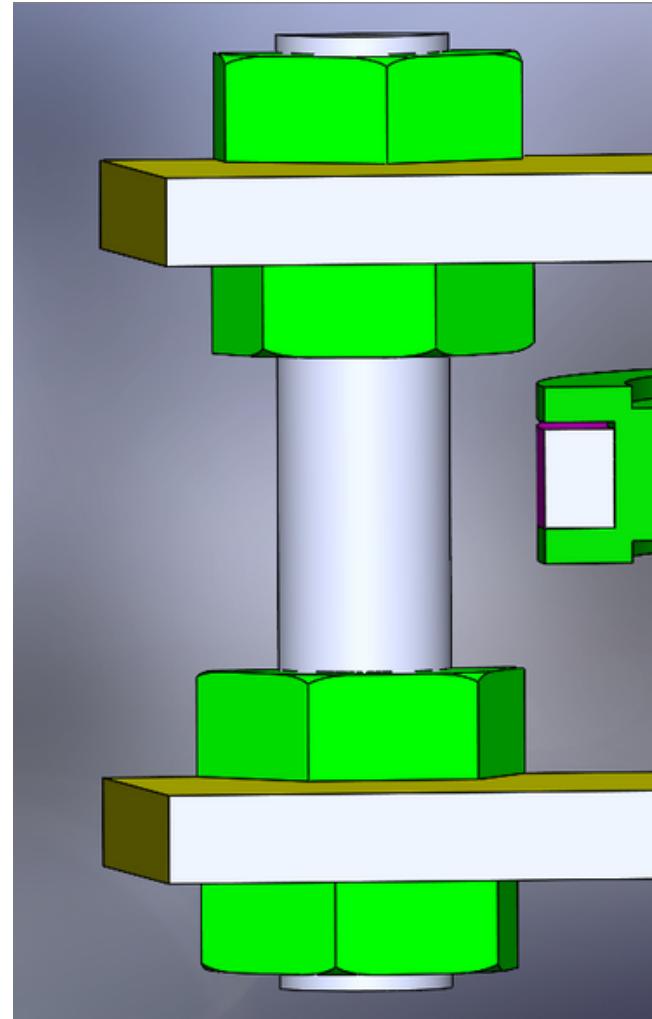
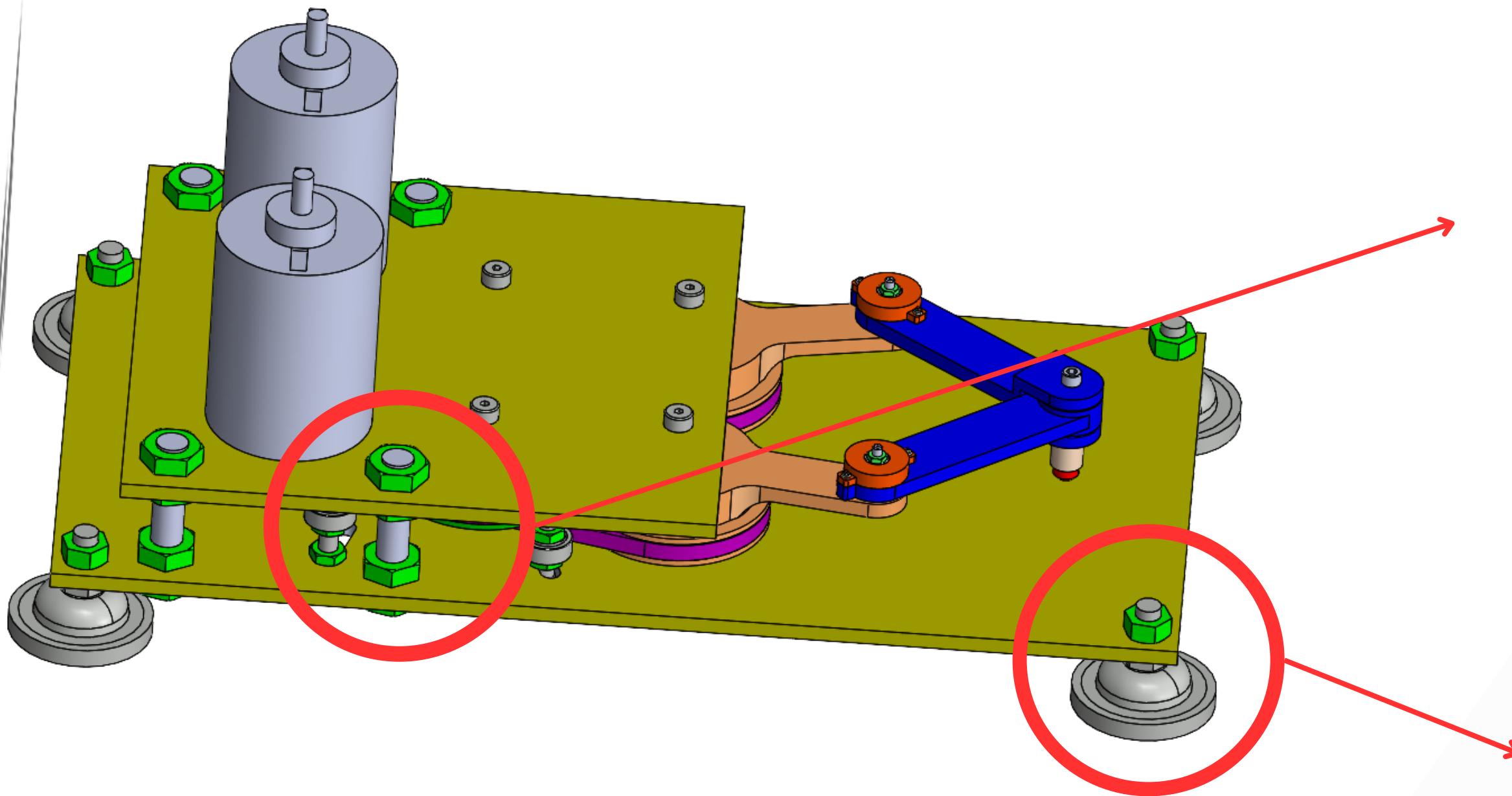
## LINKAGE

- Pivot (Ball bearing)

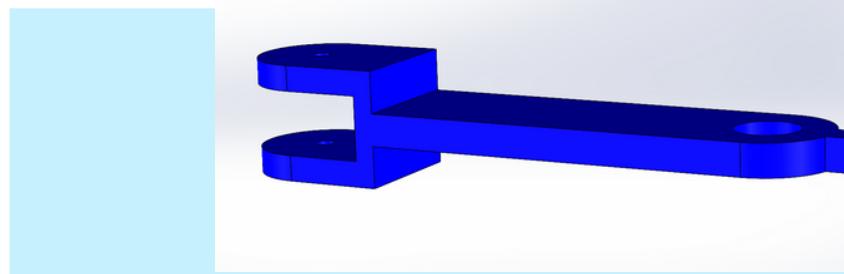
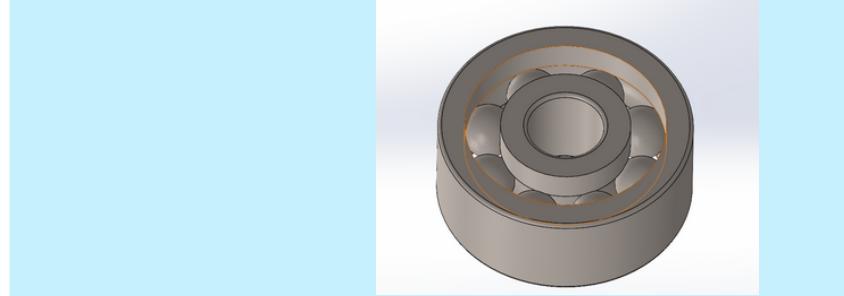
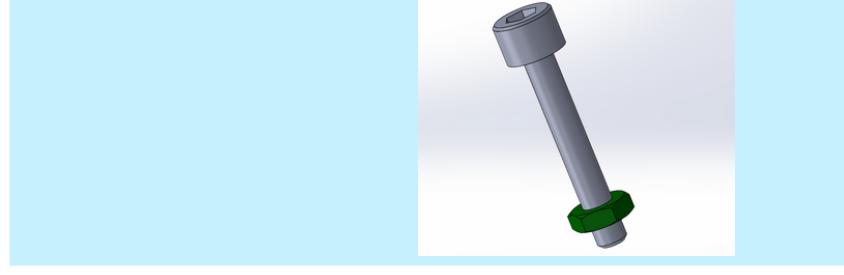
## AXIAL STOP

- Shoulder

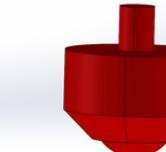
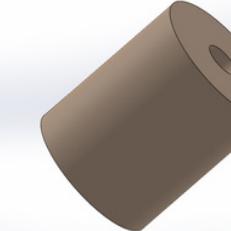
# DETAINED CUT VIEW - BASE SUPPORT



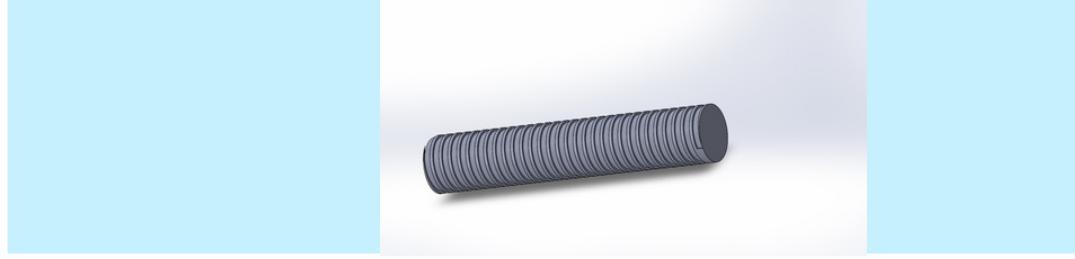
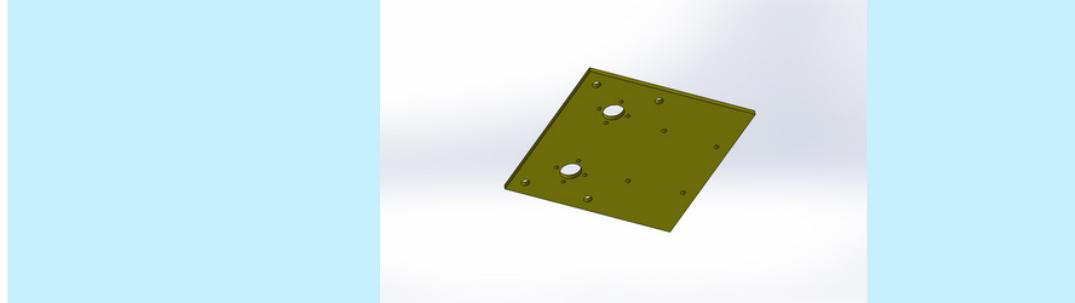
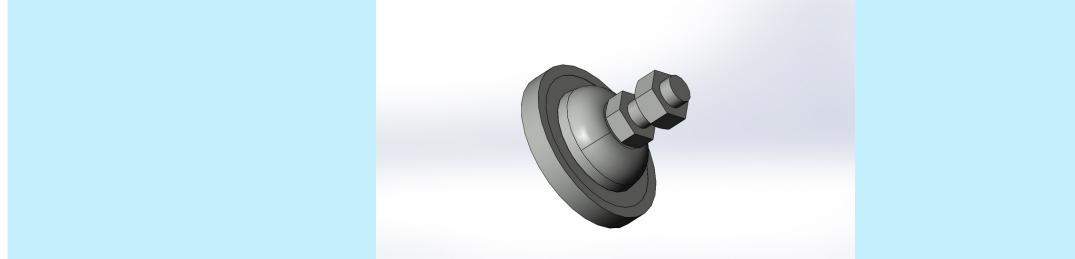
# Pantograph parts

Part	Image	How / Where ?	Cost (€)
Arm (Link)		3D printed	--
Ball Bearing		Misumi	3 - 5
Screw and nut		Misumi	2-3
Ball bearing housing		3D printed	--

# Pantograph parts

Part	Image	How / Where ?	Cost (€)
Ball transfer unit		Misumi	24
Ball transfer unit housing		3D printed	--
Pulley		3D printed	--
Belt		3D printed	--

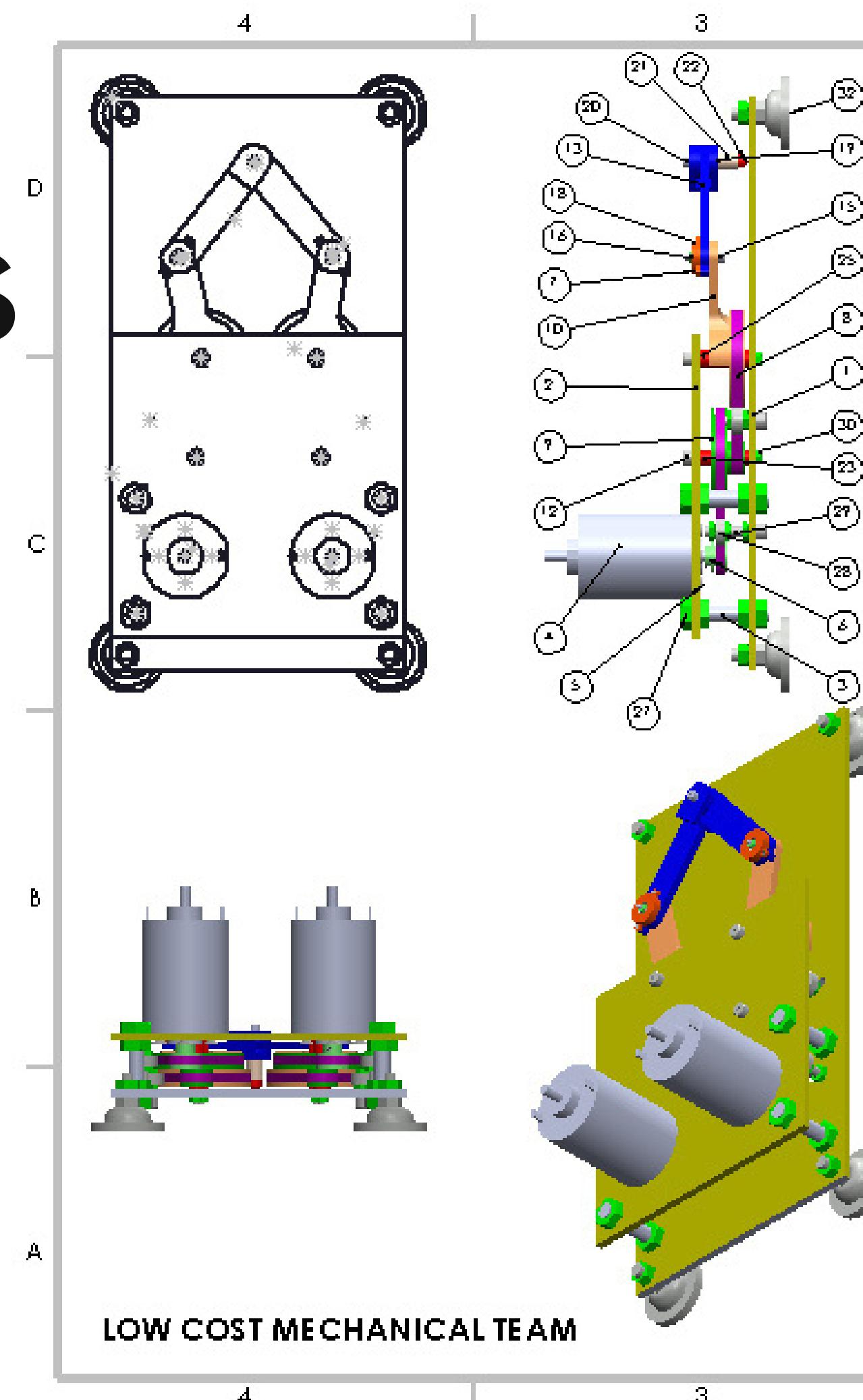
# Pantograph parts

Part	Image	How / Where ?	Cost (€)
Treaded shaft		Misumi	3-4
Plexiglass (Base)		Laser cut	--
Base foot		Misumi	4.77

# BILL OF MATERIALS

Global cost	
With motor components	648,09
Without motors components	164.29 €

## Detailed Bill of Material



The diagram shows a 3D CAD model of a mechanical assembly. The assembly consists of a base plate (Item 1), a superior base (Item 2), and various mechanical components. Callouts point to specific parts with numbers 1 through 32. The parts are color-coded: grey for threaded shafts, blue for the final motor, orange for the small pulley motor, green for the belt, purple for the combined pulley, pink for the big pulley with pantograph, grey for the shaft in pulleys, white for the arm pantograph, and black for the screw arm pantograph. The assembly includes a panto graph mechanism, a ball transfer unit, and various spacers and nuts.

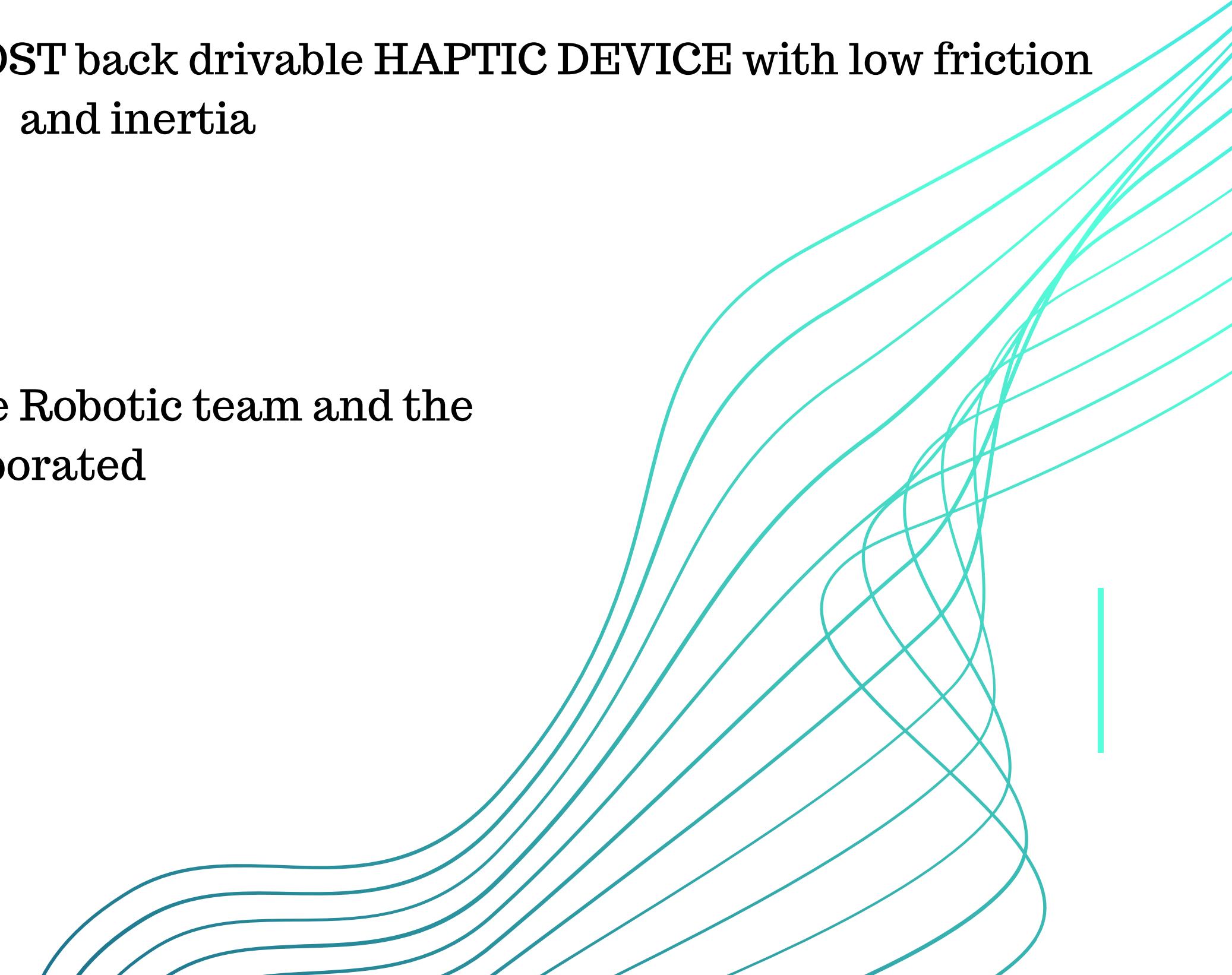
ITEM N.O.	PART NAME	Q.TY.
1	Inferior_base	1
2	Superior_base	1
3	Threaded_shaft_5mm	4
4	Final_motor	2
5	CSPLC79-SUS-MS-12	8
6	Small_Pulley_Motor	2
7	Screw_2mm	6
8	Belt	4
9	Combined_Pulley	2
10	Big_Pulley_with_pantograph	2
11	675	8
12	Shaft_in_pulleys	4
13	Arm_pantograph	1
14	AFBMA_12.1.4.1 - 0030-10 - 8,DE,NC,8_68	6
15	Screw_arm_pantograph	2
16	HNT3C-BR-M3	4
17	Spacer_in_pantograph	4
18	Ball_Bearing_housing	2
19	Fork_pantograph	1
21	Ball_transfer_unit_housing	1
22	Ball_transfer_unit	1
23	Spacer_combined_pulley_top	2
24	Spacer_combined_pulley_bottom	4
25	Spacer_big_pulley	2
26	HNT3C-BR-M6	10
27	Nut_Threaded_shaft	16
28	Tension_Ball_Bearing	4
29	CSH-ST-M6-32	2
30	Nut_pulley_Shift	4
31	CSH-STN -M6-20	2
32	Foot	4

# Conclusion

- We "succeeded" in realizing a **LOW-COST** back drivable **HAPTIC DEVICE** with low friction and inertia
- **Limitation: COST**
- To prototype this design, the work of the Robotic team and the Virtual environment team will be incorporated

## Deliverables

- CAD Files
- Report
- Detailed bill of materials



# THANK YOU

