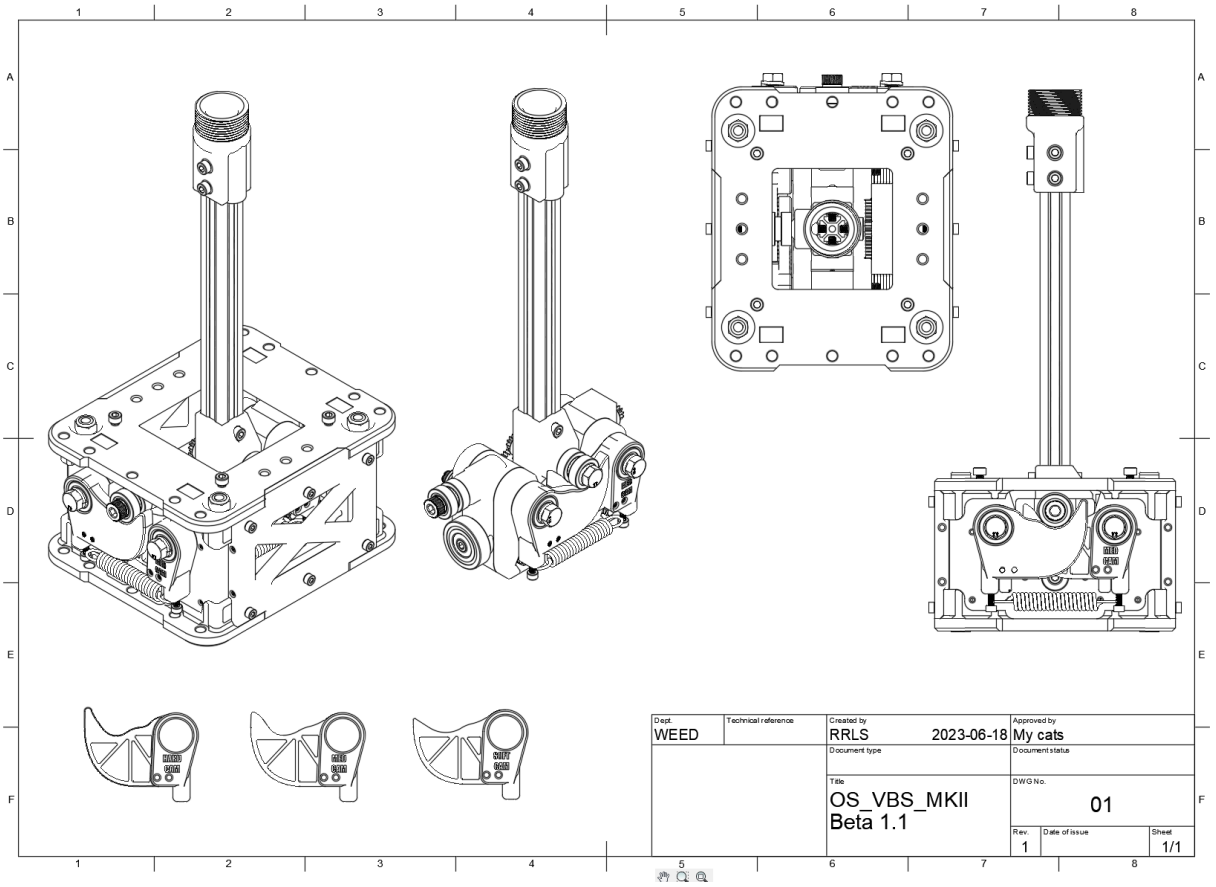


Open Source - Very Big Stick MKII

MECHANICAL BUILD GUIDE

REVISED Beta v1.3.1

2024-04-12

Build Guide Videos

Instructions on how to assemble the OS_VBS MKII gimbal is available on rightrudderleftstick's youtube channel. Please watch and follow carefully on how to assemble these components.

You can watch the video at this URL:
https://www.youtube.com/watch?v=IdYbF5dOYag

The Electrical build guide, as well as the office chair mount is available on this video.

You can watch the video at this URL:
https://youtu.be/jo0v6YuI9vU

Bill of Materials

This is a live link to a spreadsheet containing the bill of materials for hardware and parts to be printed.

Part name	Quantity	Thicker walls required?	grams each	Total grams	Optional?
PRIMARY GIMBAL					
PitchFrame_TopPlate.3mf	2	n	118	236	
PitchFrame_SidePlate.3mf	2	n	47	94	
Cam_rollerSpacer.3mf	2	n	1	2	
~~*Cam_bearing_washer (No longer needed with new cams)*~~	~~4~~	~~n~~	~~0~~	~~0~~	OBSOLETE
MainSleeve.3mf	1	y	54	54	
PitchFrame_PillowBlock.3mf	2	y	90	180	
RollFrame_PitchPin_Gear.3mf	1	y	43	43	
RollFrame_PitchPin_Camside.3mf	1	y	46	46	
RollFrame_GearSide.3mf	1	y	49	49	
RollFrame_CamSide.3mf	1	y	49	49	
M12_WasherSpacer.3mf	2	n	2	4	Y
SOFT_CAM.3mf (MED or HARD)	4	y	23	92	
TLE5011_frame.3mf	2	n	2	4	
TOTAL Filament PETG				***849***	grams
TM Grip attachment with Offset					
TM_VIRPIL_ADAPTER_OFFSET.3mf	1	y	50	50	
MINI_DIN_Holder.3mf	2	n	1	2	
Optional Add-ons					
OuterCamCover_Solid.3mf	2	y	109	218	
2020_CYC_OFFSET.3mf	1	y	36	36	Y
Cyclic_RestrictorPlate_20degrees.3mf	1	y	40	40	
ASSY_USBCABLE_STRAIN_RELIEF.3mf	1	y	1	1	
Chair Base Add-on					
2020_Crossbar.3mf	2	y	57	114	
CHAIR_WHEELCHOCK.3mf	1	y	100	100	

CHAIR_WHEELCHOCK_Mirror.3mf	1	y	100	100	
TOTAL Filament PETG				***661***	grams

PRIMARY HARDWARE		**Notes**	
1KG PETG 1.75mm filament	1	PLA+ untested. Do not print the CAMs in PLA as they will distort over time.	
2020 v slot aluminum rod - Cut to length	1	Length depends on your choices	
608 bearings	12		
6003 bearings	4		
18x24.7x1 Teflon Washers	4	https://www.aliexpress.com/item/4000935512060.html	Y
M3x8mm	8	Do nut use countersunk heads, 4 are for mounting the TLE5011 sensors	
M4x20mm Socket head	20		
M5 vslot drop in nuts	11		
M5x8mm Socket Head	10	6 less if TM adapter is not used	
M5x16mm Socket head	2	Put into the middle of the camside 6003 bearings for extra strength	Y
M5x50mm	2	For the counterweights	Y
M8 washers	4		
M8 Spring Lock washer	6		
M8 Nylon Lock nuts	8		
M8x35mm HEX Head	3	Must be hex head for clearance	
M8x50mm socket head	3	Two of them must be Socket Headed	
M8x80mm HEX or Socket Head	2		
M8x100mm HEX head	4	HEX head only	
M12 Washers	20	For counterweights	Y
FRT-C2-301-G1 Rotary damper	2	Make sure to get the kind that dampens both directions!	Y
Extension spring with loop ends. ~60mm unloaded	2	I used this mcmaster part in the design (3630n293), untested! You'll want to test many springs	
Extension spring with loop ends. various lengths	2	This is the second set of side springs, try several to tweak	Y
M3x6mm standoffs	4	They come with the TLE5011 kit	
M3x6 Phillips head screws	4	They come with the TLE5011 kit	

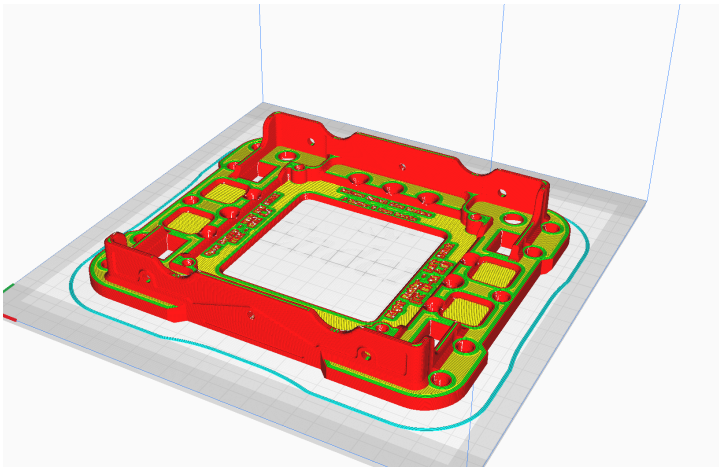
Chair Base Add-on		**Notes**	
1KG PETG OR PLA+ 1.75mm filament	1	These extra parts can be printed win PLA+	
M5x8mm Socket Head	8	For the crossbars	
M5x12mm Socket head	8	For the wheel chocks	
M5 vslot drop in nuts	16		
M6x12mm	4	For attaching the base to the 2020 bars	
M6 vslot drop in nuts	4	MUST BE FOR 20 SERIES - NOT LARGER. FIT IN 6mm Groove	
2020 v slot aluminum rod - Cut to length	2	50cm is a good length.	
Optional Add-ons		**Notes**	
M4x20mm Socket Head	8	For the side covers	
M5x20mm Socket Head	4	For attaching the restrictor plate	
M3x8mm	2	For attaching the strain relief	
M5x8mm Socket Head	18	2020_CYC_OFFSET.3mf	y
M5 vslot drop in nuts	18	2020_CYC_OFFSET.3mf	y
ELECTRICAL		**Notes**	
5pin mini din connector (male) for TM adapter	1	https://www.aliexpress.com/item/32859748866.html or 2092-KMDVLX-5S-N-1-ND at digikey	y
TLE5010 sensor kit with magnet and PCB	2	https://www.aliexpress.com/item/4000549883214.html	
Assorted 22 AWG wire in various colours	1	get at least a meter worth in several colours.	
STM32F103C8 microcontroller	1	Be careful to get the exact right version that supports Freejoy, beware of counterfeits	Y
Breakout PCB board	1	Can be ordered from PCBWAY: https://www.pcbway.com/project/shareproject/Open_Source_Very_Large_Stick_Freejoy_MMjoy2_breakout_board_f66f472f.html	
Arduino Pro Micro	1		

3mf Part Reference

Here is information on each 3mf file included with the build and a reference image showing the correct print orientation.

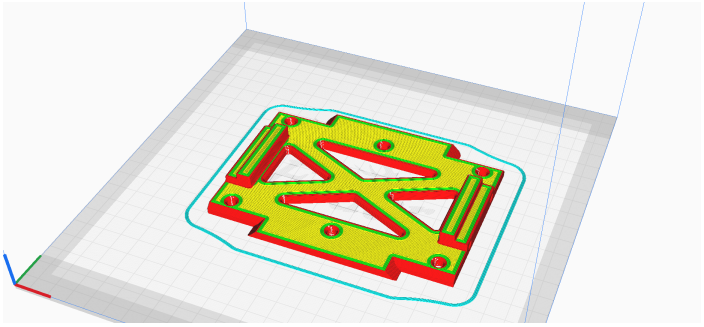
PitchFrame_TopPlate.3mf ***(revised 1.3)***

Quantity: 2 (print with supports)



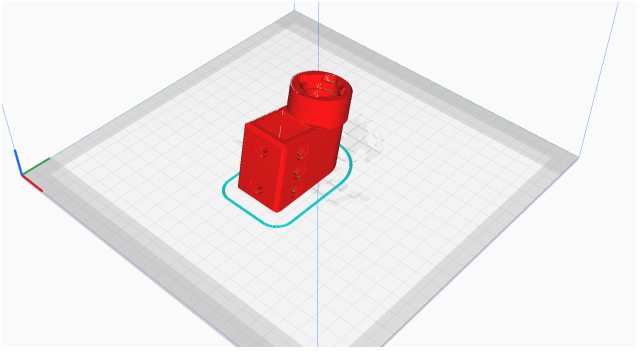
PitchFrame_SidePlate.3mf

Quantity: 2



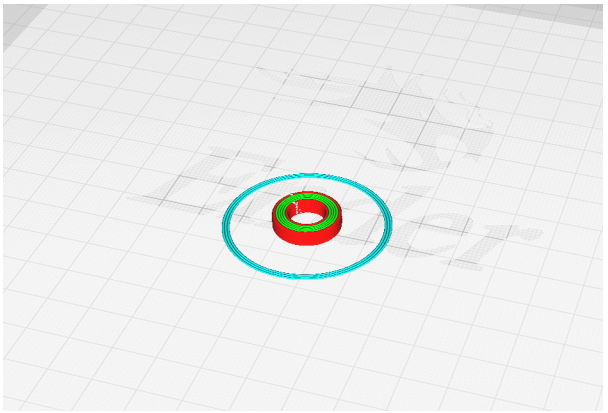
TM_VIRPIL_ADAPTER_OFFSET.3mf (replaced the original TM mount)

Quantity: 1



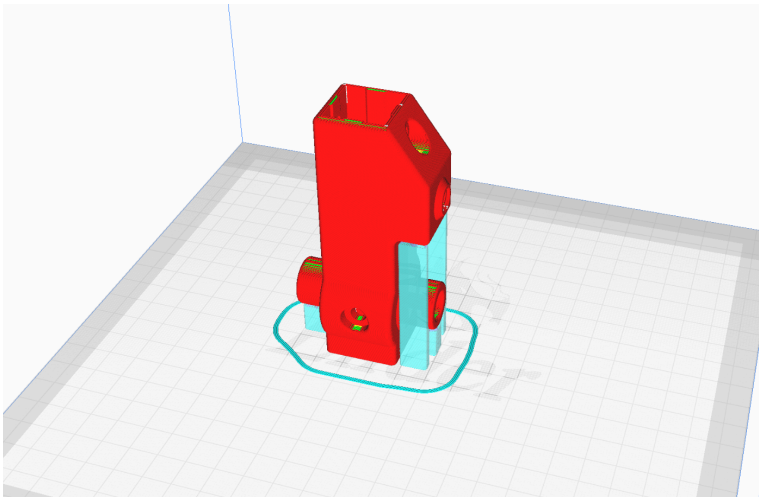
Cam_rollerSpacer.3mf

Quantity: 2



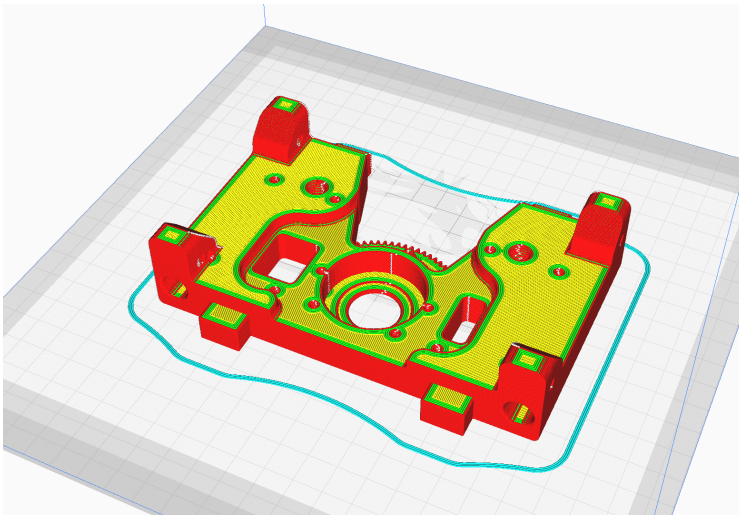
MainSleeve.3mf

Quantity: 1 (print with supports)



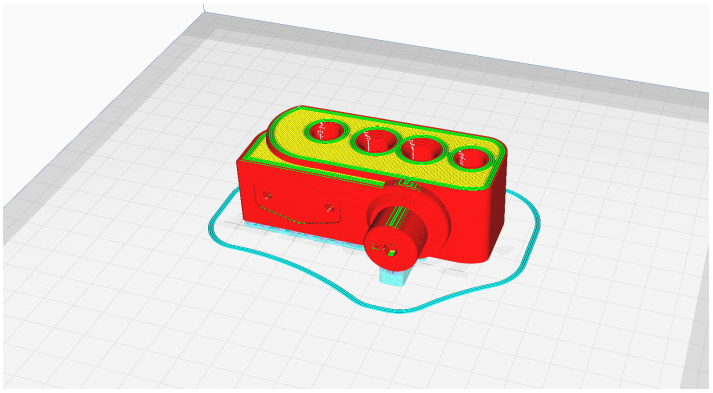
PitchFrame_PillowBlock.3mf ***(revised 1.3)***

Quantity: 2



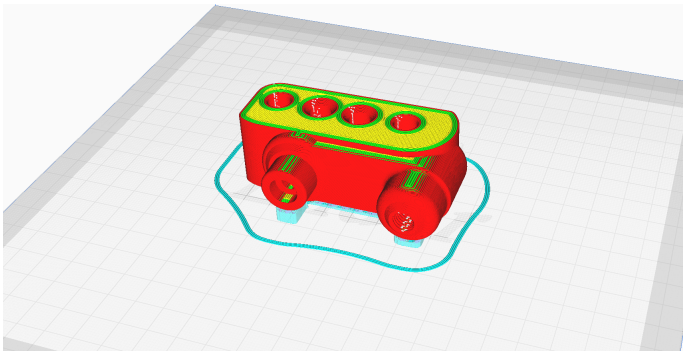
RollFrame_PitchPin_Gear.3mf

Quantity: 1 (print with supports)



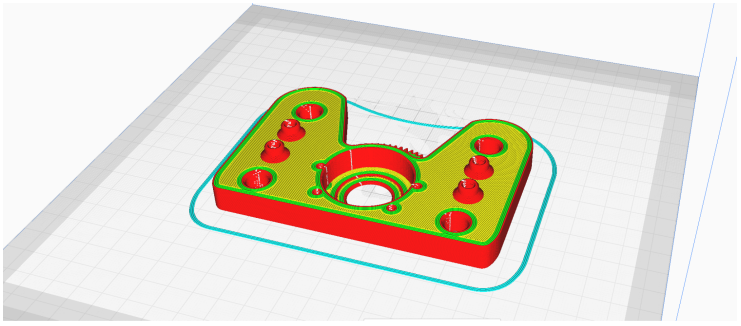
RollFrame_PitchPin_Camside.3mf

Quantity: 1 (print with supports)



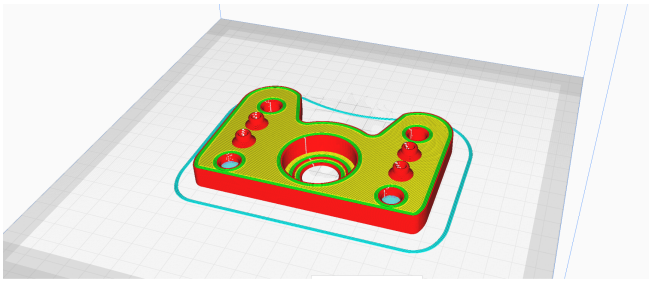
RollFrame_GearSide.3mf

Quantity: 1



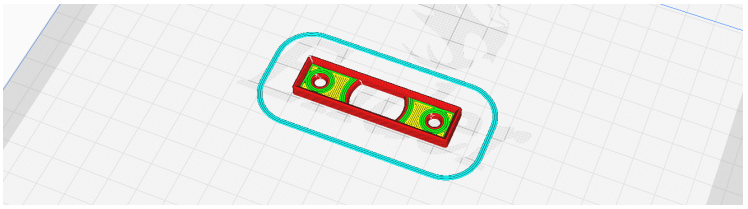
RollFrame_CamSide.3mf

Quantity: 1



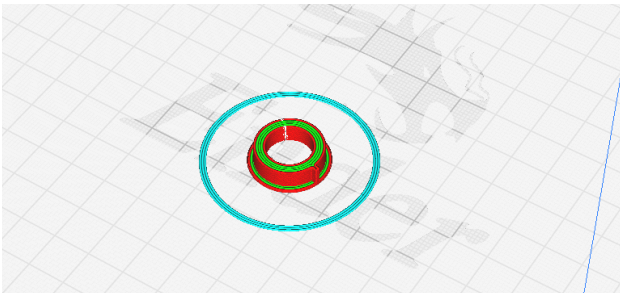
TLE5011_frame.3mf (new for 1.3)

Quantity: 2



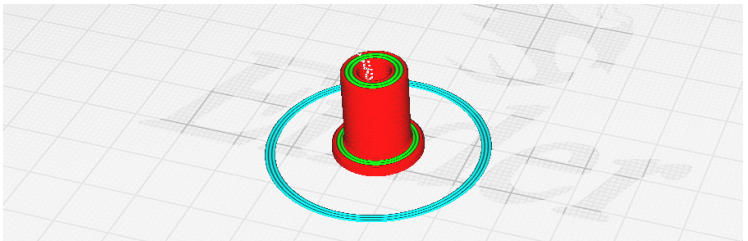
MINI_DIN_Holder.3mf (new for 1.3)

Quantity: 1



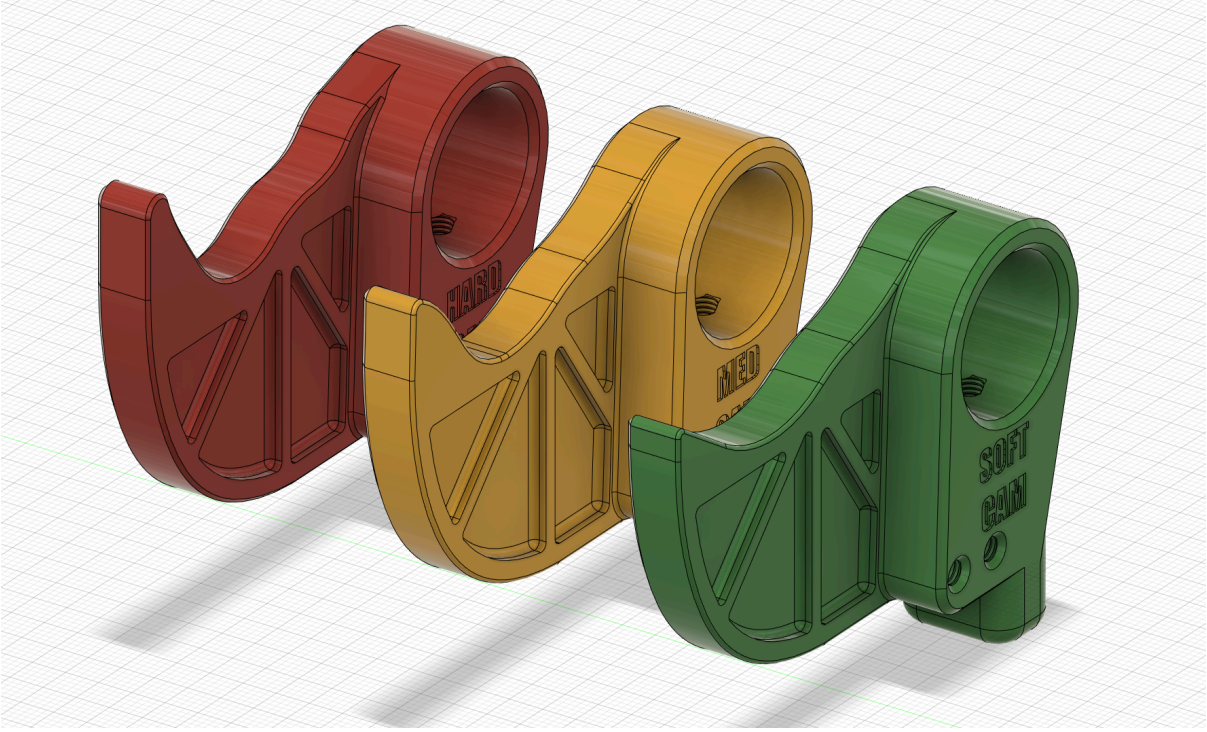
M12_WasherSpacer.3mf

Quantity: 2
Optional



CAM Profile Options

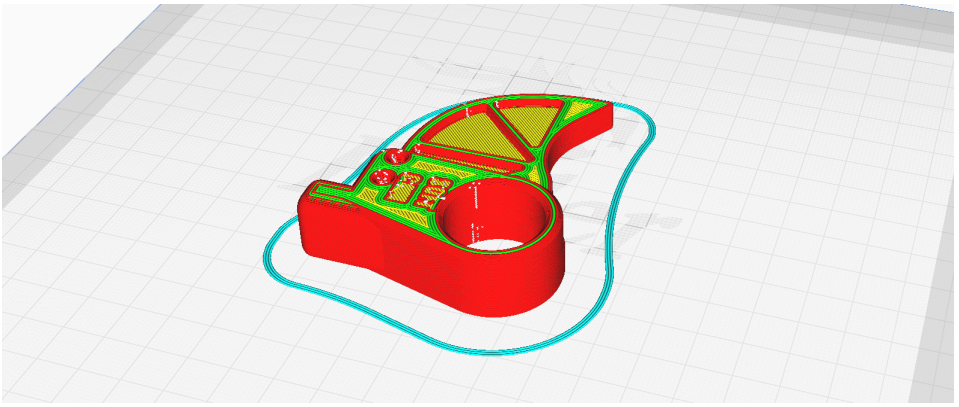
The design currently comes with three different options of CAM profiles, They can be mixed and matched on different axis to produce different force feelings, such as a stiffer pitch but a lighter roll motion. They are scaled from Soft to Hard.



They also feature mounting for a bottom extension spring as well as 4 M4 holes on the side for mounting a secondary side spring. This can either augment the force of the primary spring or allow the use of a very light spring for low spring force applications like helicopter cyclics.

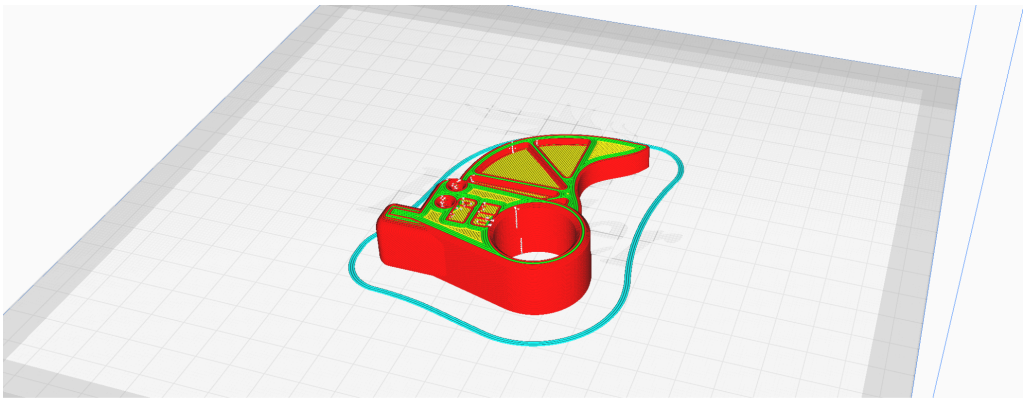
SOFT_CAM.3mf

Quantity: 4



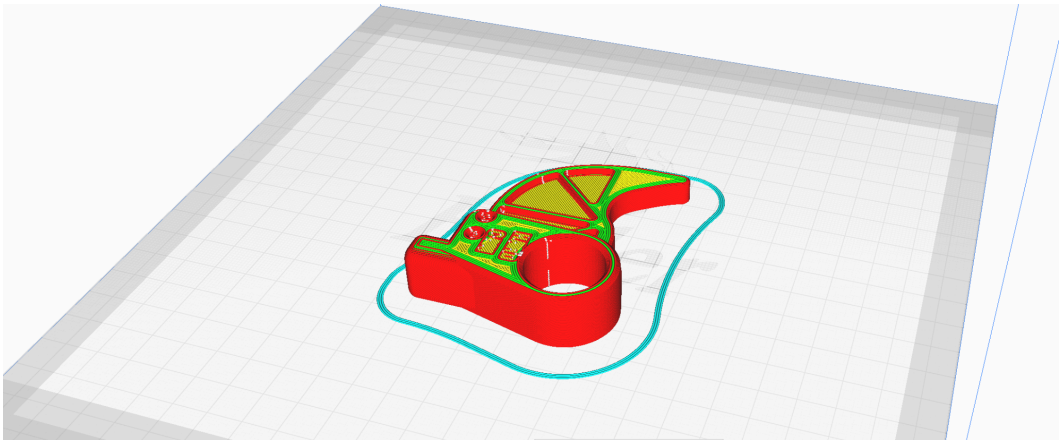
MED_CAM.3mf

Quantity: 4



HARD_CAM.3mf

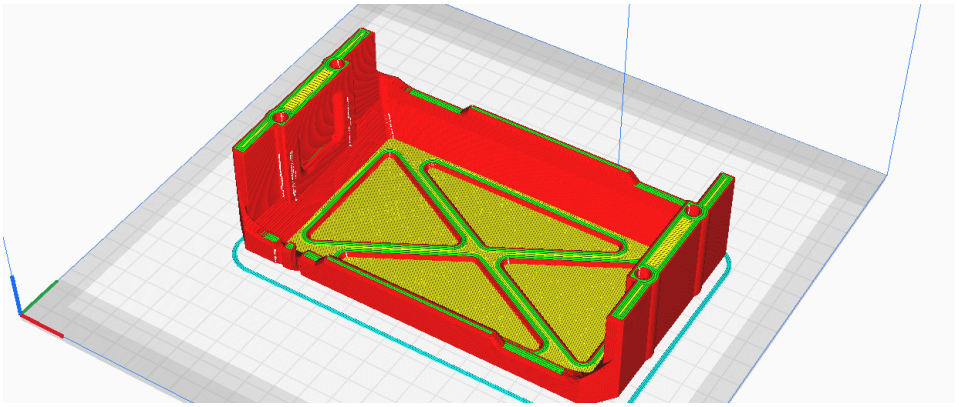
Quantity: 4



Optional Add-on Parts

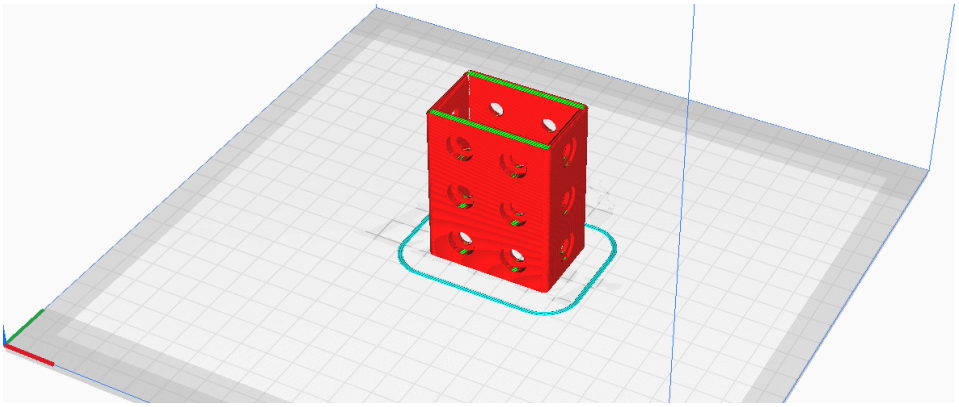
OuterCamCover_Solid.3mf

Quantity: 2



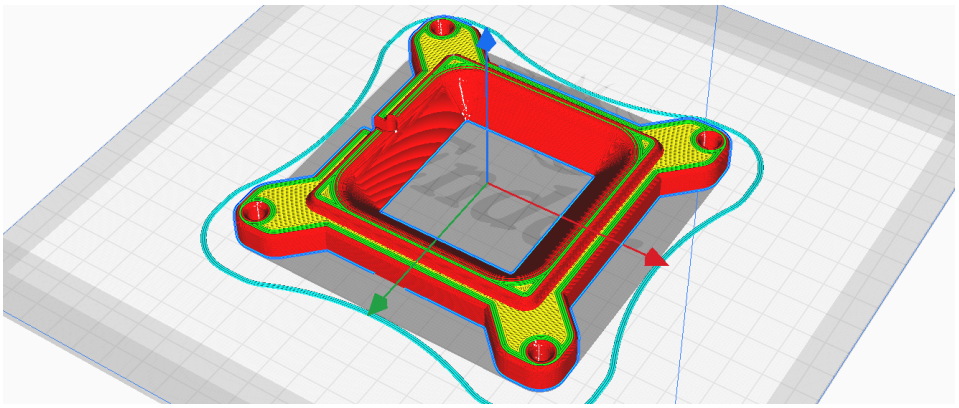
2020_CYC_OFFSET.3mf

Quantity: 1



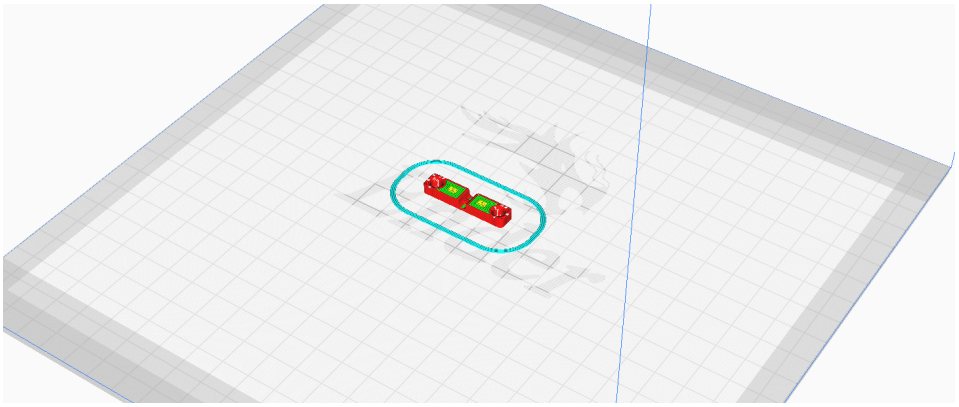
Cyclic_RestrictorPlate_20degrees.3mf

Quantity: 1



ASSY_USBCABLE_STRAIN_RELIEF.3mf

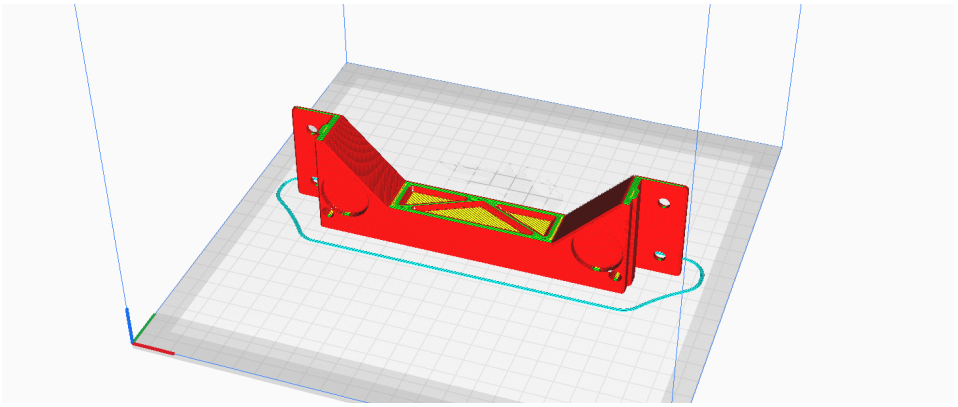
Quantity: 1



Chair Base Add-on

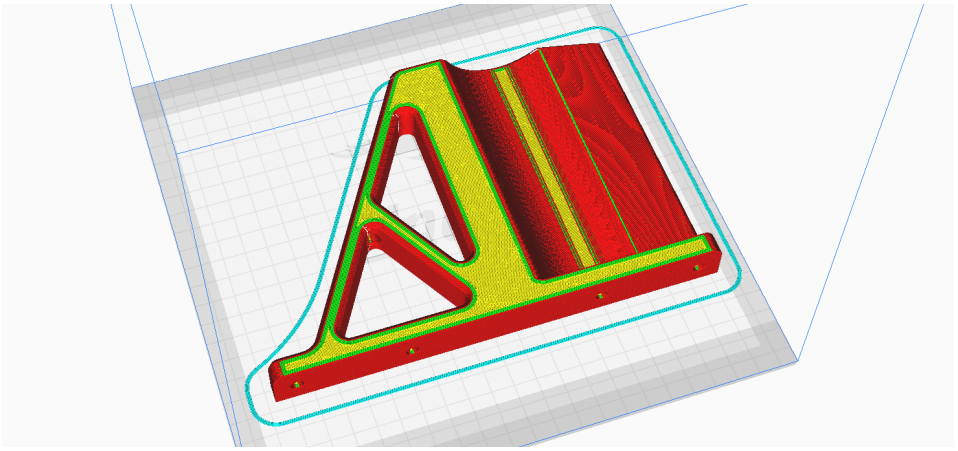
2020_Crossbar.3mf

Quantity: 2



CHAIR_WHEELCHOCK.3mf

Quantity: 1 *(print with supports)*



CHAIR_WHEELCHOCK_Mirror.3mf

Quantity: 1 *(print with supports)*