

Trunk bag quick release adapter

 **aiber**

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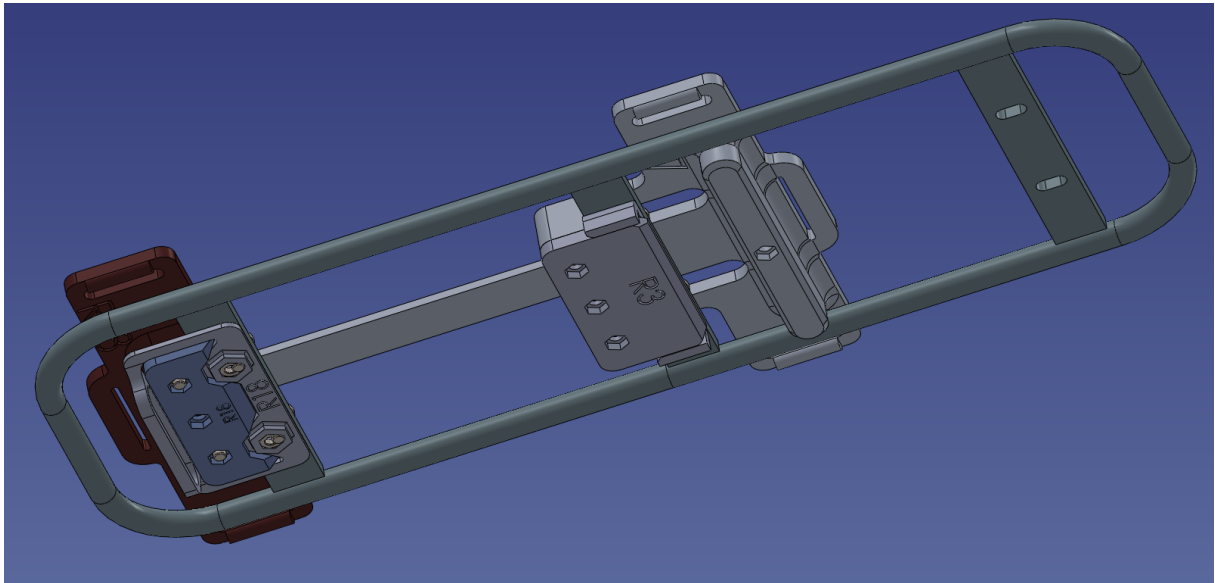
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Summary

parts used to convert a trunk bag with velcro strap for faster mounting & release

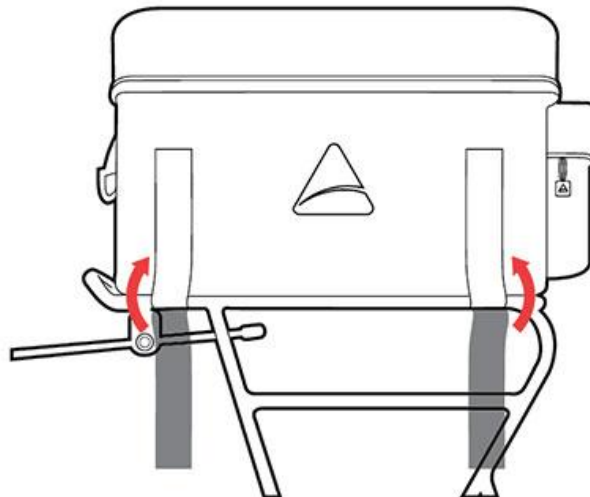
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Tags: [bag](#) [adapter](#) [rack](#) [bicycle](#) [bike](#) [quick](#) [strap](#)
[release](#) [trunk](#) [velcro](#) [rear](#)



Abstract

- the part unlocks the ability to quickly & securely mount & dismount trunk bags
- trunk bags typically mount with velcro straps which are quite cumbersome & slow, although secure
 - newer ones will feature 4 straps, one in each corner, like this:



- I briefly looked at Ortlieb's solution & tried to reverse engineer it: [Ortlieb-style adapter for bike trunk bags](#), but soon abandoned it for the reasons outlined there

Commercial examples

- Here are a variety of other commercial examples I looked at

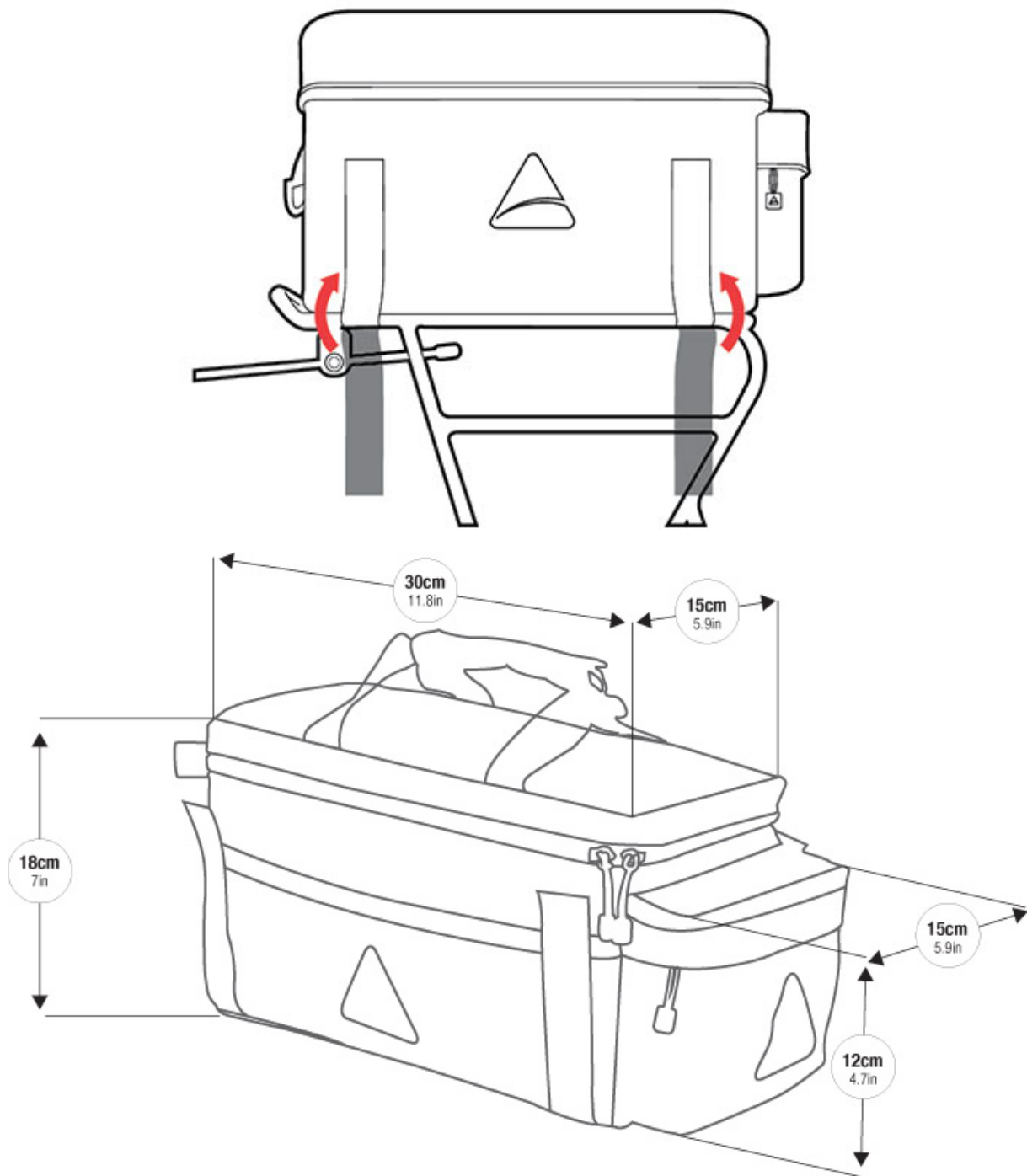
- I won't get into the pros & cons of each, but they helped guide my thinking to some degree

Links

- [Tailfin Cycling Carbon Rack Reviews: Trunk & Pannier](#)
- [Racktime SnapIt 2.0](#)
- [Bontrager MIK](#)
- [Topeak MTX](#)
- [Ibera PakRak Commuter Bike Bags Clip-on System](#)

Trunk bag compatibility

Trunk bags need straps like this.



The one I use

is an old Nashbar trunk bag, which looks like this:

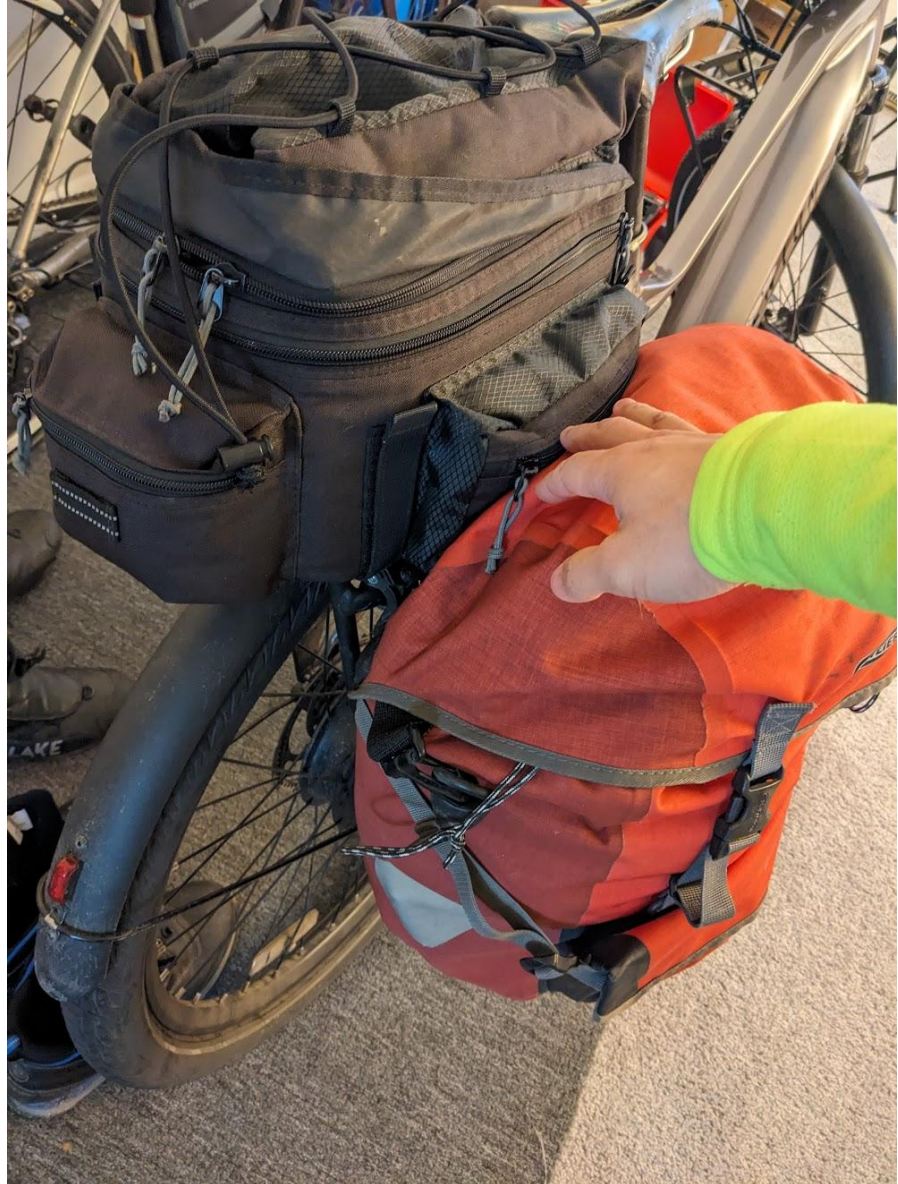


- It's nothing special
- I bought it many years ago but barely used it, in large part due to how cumbersome it was to mount it & dismount it

Requirements

These are the guidelines & constraints I used to narrow the scope of the solution.

- mechanism accessible from rear of rack
 - not the sides: I might have panniers in the way
 - case in point:



- not the front: the seat's in the way
- must the rear, this is the only place I can depend on being accessible
- mechanism should be mounted on the rack, not on the bag
 - bag will be set down on the ground, so wear accumulates faster on bag-mounted mechanisms
- as few parts as possible
 - for reliability, especially with regard to the mechanism
 - doubly so if the mechanism is mounted to the rack & therefore exposed to the elements

- fast to mount & dismount to a rack
 - definitely has to be faster than attaching via the velcro straps that come on most trunk bags
- secure mount
 - needs to stay on despite potholes
- provision for a shoulder strap mount
 - my trunk bag doesn't have a shoulder strap & this was a great way to add that ability
- design must add minimal bulk to the trunk bag
 - especially vertical height, which at some point would start impacting the handling of a high center of gravity

Installation

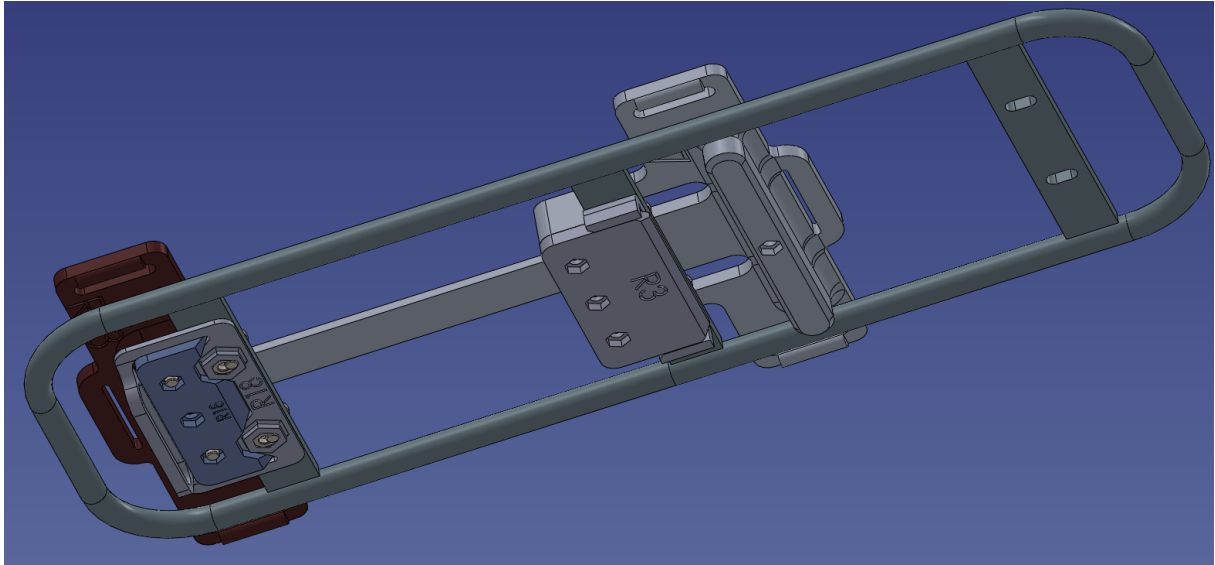
- Each of the 4 velcro straps goes through slots in the corners of the TIE DOWNS
 -





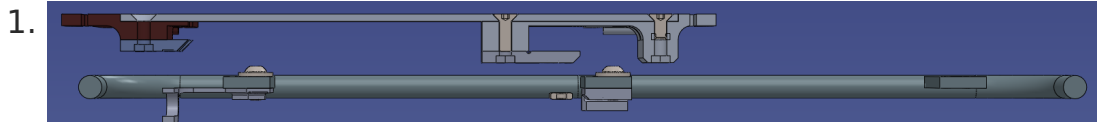
- the loops at the front & back of the bag are used for a shoulder strap mount
- the blue piece in the middle is the SPINE, used to set the spacing between the 2 TIE DOWNS & to keep them relatively coplanar
 - because I wanted the whole bag-side assembly to be slim, this posed a challenge, as 3-5 mm thick FDM plastics are not very rigid regardless of material
 - as of 2024-02-18 on rev 18 hardware, it's a nuisance, but I've been running without a SPINE piece
 - it is definitely less stable & curvature of the bag can unseat the rev 18 mechanism in edge cases

Early mechanisms & how it works

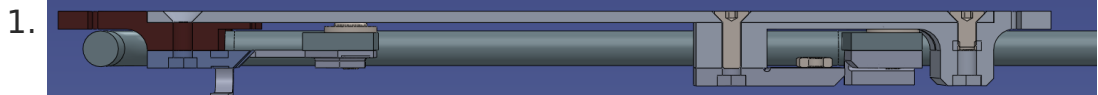


Here are some section views:

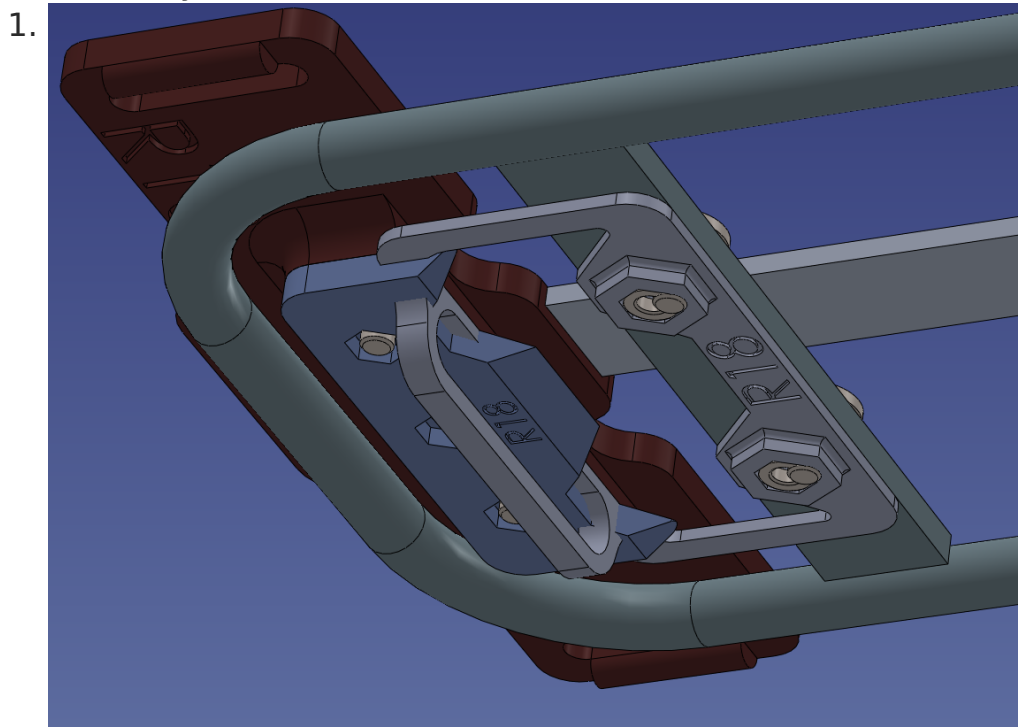
1. bag mounted parts are roughly positioned above the rack



2. mechanism plopped straight down



2. in rev 18, the rear (left in this view) mechanism is sprung down, out of the way



2.



3.



4. here is the snap by itself

1.

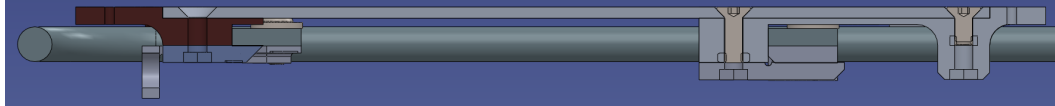


2.



3. bag is scooped forward, engaging the snap in the rear

1.



1.



2. in this way, both the front & rear JAWs are engaged & captured such that the bag cannot separate from the rack vertically

Front is anchored by a simple sliding fit

- this feature has been largely constant throughout all the iterations
- the rear TIE DOWN is anchored by way of a variety of mechanisms explored below



The same, not attached to the bag yet



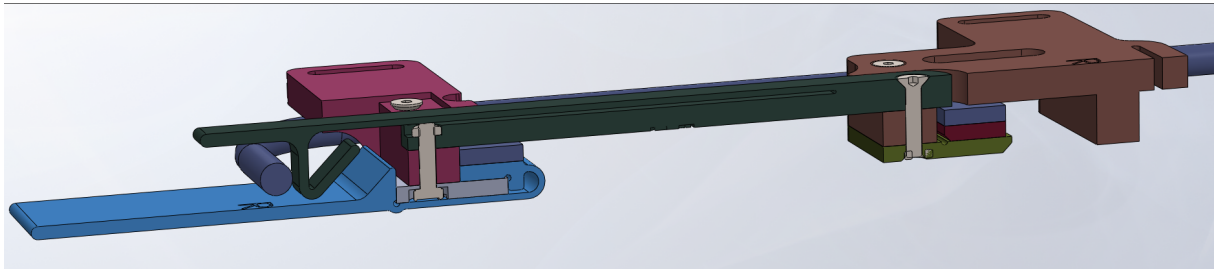
Suitability

- only works with trunk bags with 4 velcro straps, 1 in each corner
- spacing of parts is critical & entirely depends on the rear rack used
 - in my case, the rear rack is the stock one that comes with an Aventon Level.2 ebike
 - here is a picture of the rack:



Iterations

I used to use the spine as the flexure or something near it:

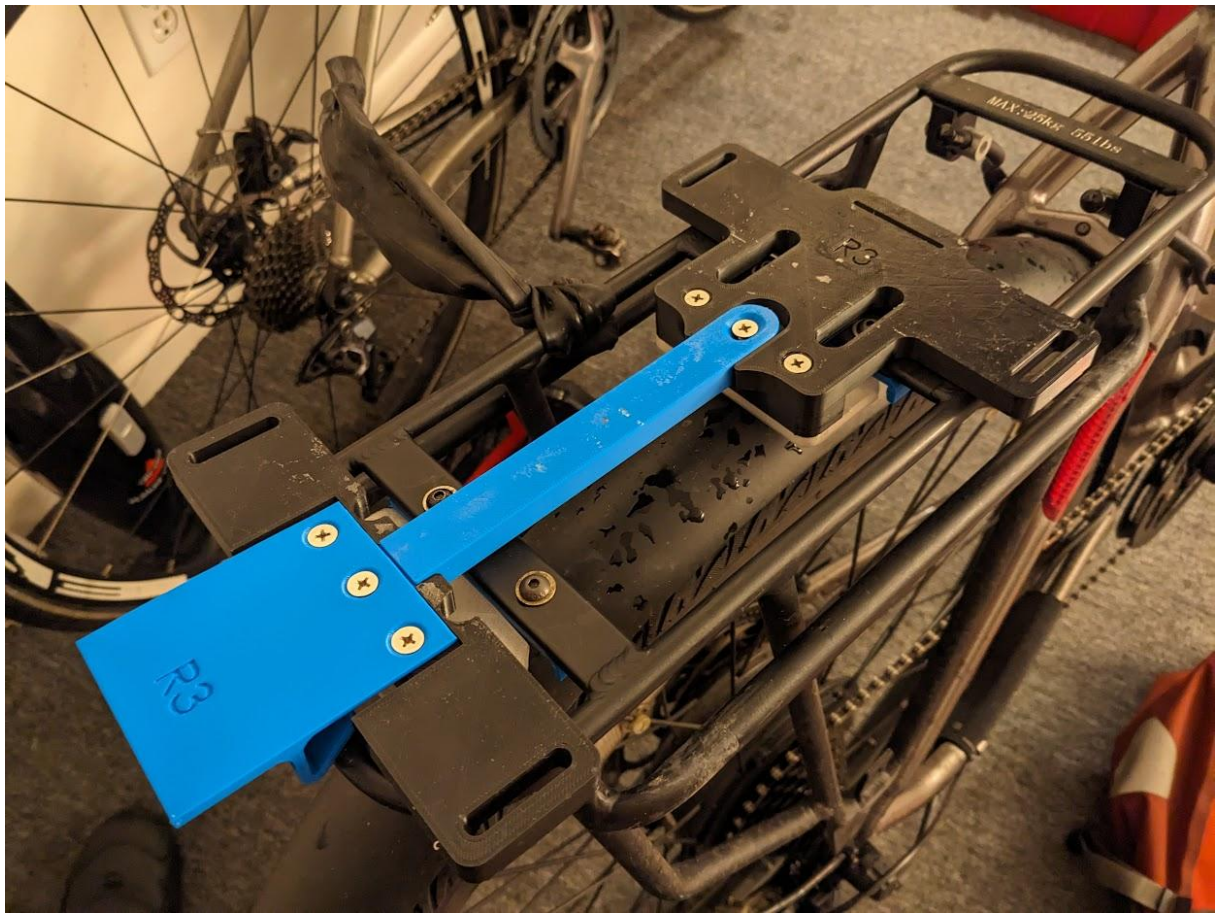


- the green piece in the screenshot above was the SPINE with an integrated flexure
- I abandoned this because its locking direction would load the flexure in compression & it would simply buckle out of the way
- here it is in real life



Rev 3

used a short flexure that was sort part of the rear TIE DOWN, but the flexure was very stiff out of PLA.



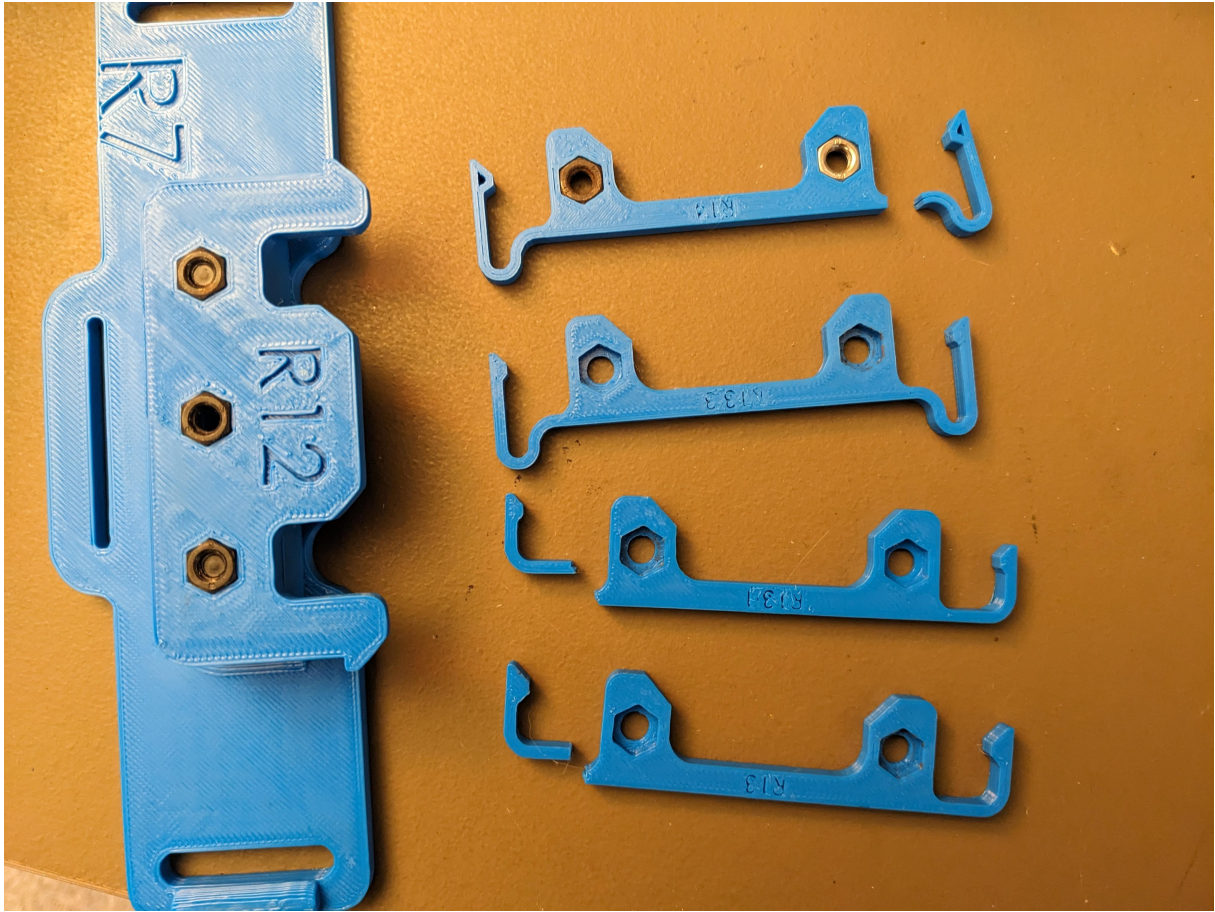
Here it is locked, preventing rearward travel. To disengage it, the lever had to be pressed further into the bag (not great).



This allowed use of a the same JAW as in the front though, which was nice:



Rev 13-14



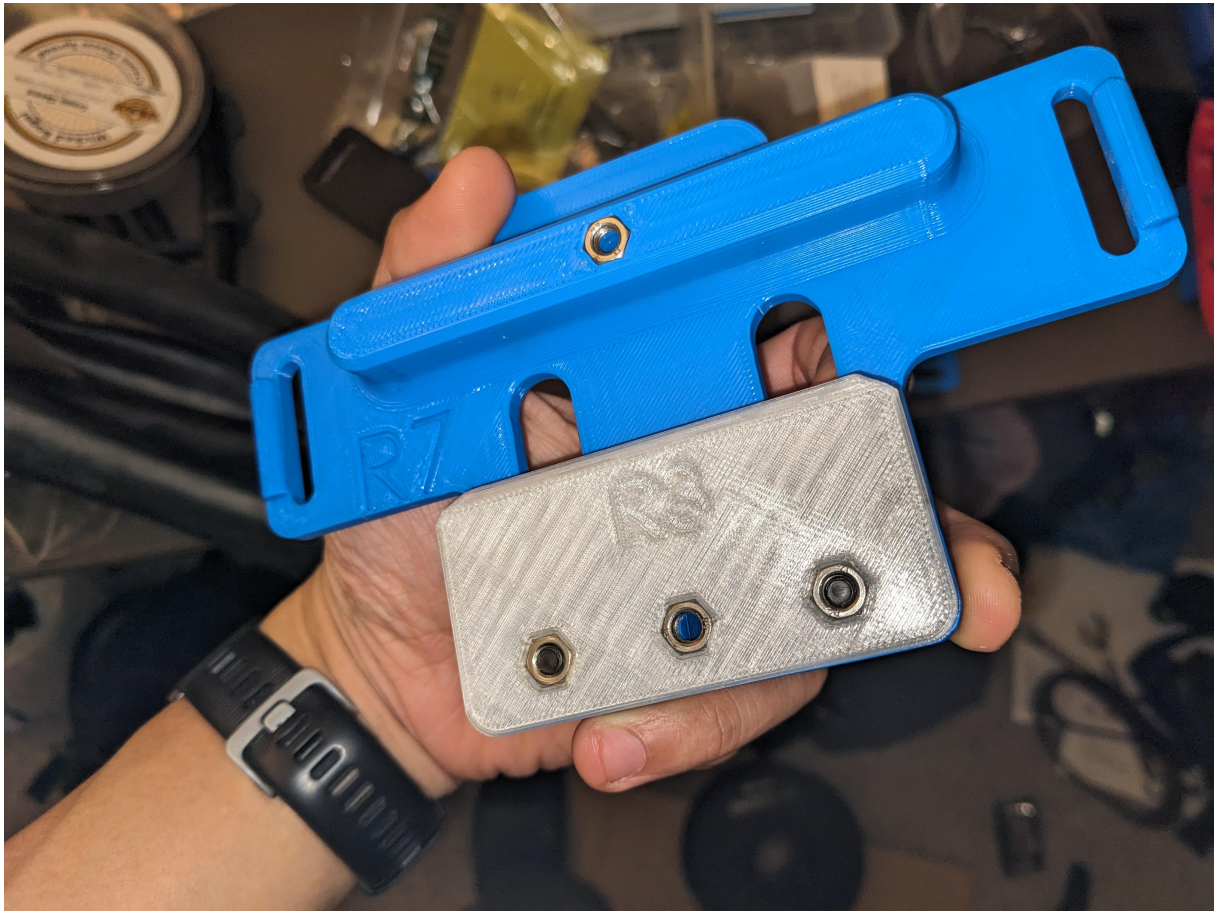
- snap fits didn't work in PLA
- lesson learned: print in nylon or PETG when flexure is required



I was sort of hesitant about this design because:

- it required supports to print (not much)
- the loop would be pulled down (with gravity) to disengage & I wanted something that would be pressed in (upward against gravity) to disengage
 - pulling the loop down only works with low load (which is realistic) because the tensile loads are carried by 2 small areas of layer-to-layer adhesion on either side of the loop





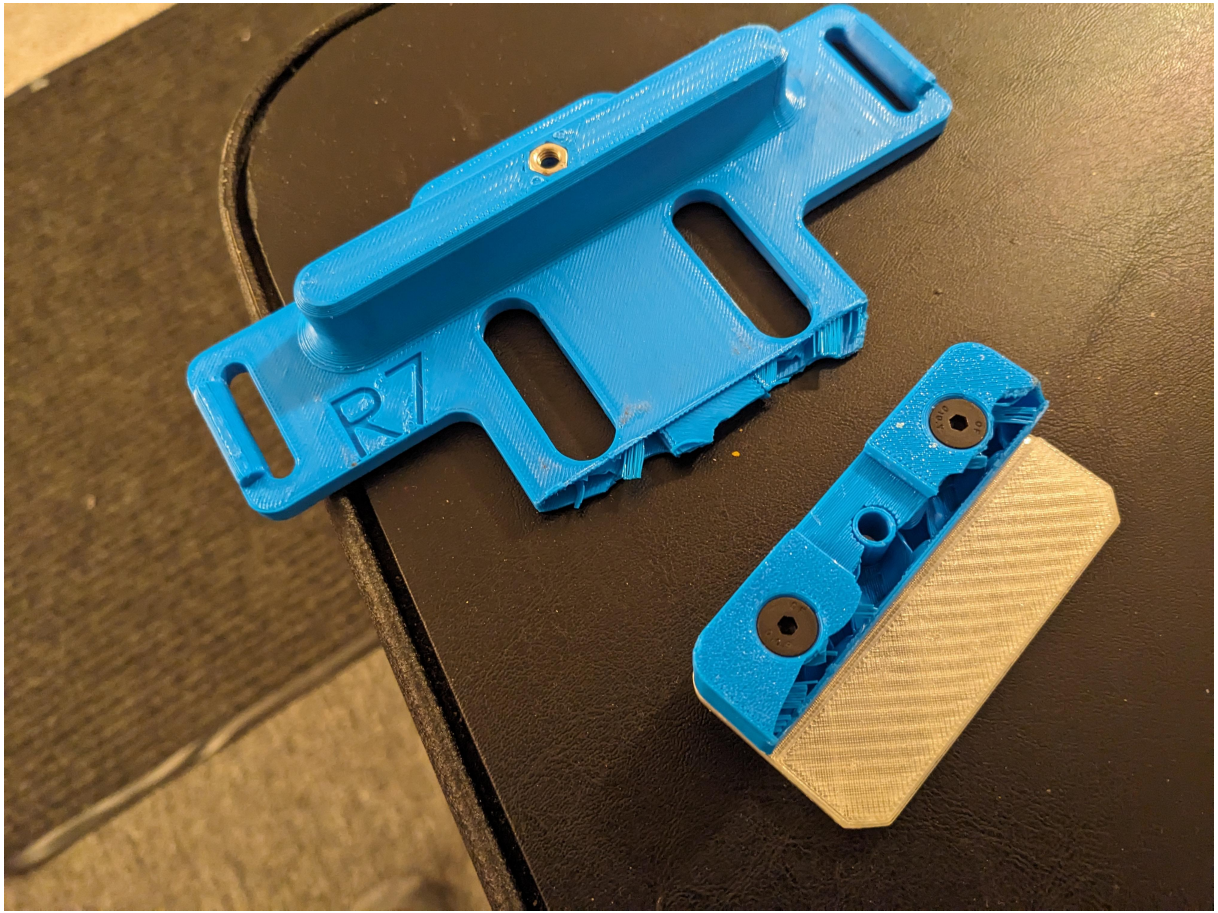


Performance

- I've tested the bag with rev 18 hardware over about 100 miles as of 2024-02-18 & it seems to be doing well
 - it has not yet fallen off the bike
- I used to use a pannier all the time simply because it was easier to mount & dismount, but there was a ton of unused space
- I don't notice the weight now being centered as opposed to being on one side (as was the case with a single pannier), but it's nice that the weight is centered now
- the hardware can be most seriously improved by inclusion of a SPINE piece that I'm a bit lazy in implementing
- the whole process of mounting the bag has gone down from probably 30-60 seconds depending on whether I have panniers on simultaneously) to about 3-15 seconds

Rev 7: TIE DOWN, FRONT

- 2024-02-24 experienced a breakage with rev 7 hardware
- I have since created rev 19, which should help distribute the flexural load across the cross section much better
- I'm certain that this problem was partly due to the fact that I had no SPINE installed, which will change in my next installation



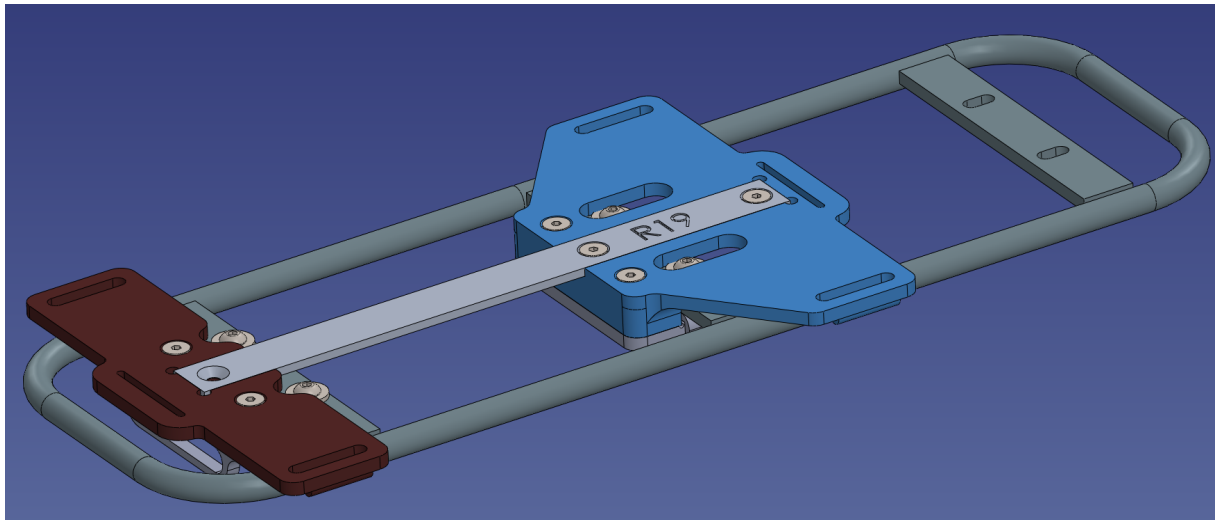
Rev 19 (2024-02-25)

- See the highlighted part: TIE DOWN, FRONT
- also of note is the inclusion of a SPINE part
 - this was originally meant to be made out of 1/8" thick (3.175 mm) sheet metal for high rigidity in a thin form factor, but I'm too lazy to make it myself, so I will try printing at high infill PLA & consider annealing afterward

From this [paper](#) (EFFECT OF INFILL PATTERN AND BUILD ORIENTATION ON MECHANICAL PROPERTIES OF FDM PRINTED PARTS: AN EXPERIMENTAL MODAL ANALYSIS APPROACH), we have:

We observe that triangles infill pattern with flatwise orientation has the highest flexural modulus

I'm going to first try triangles, 30% infill in PLA.



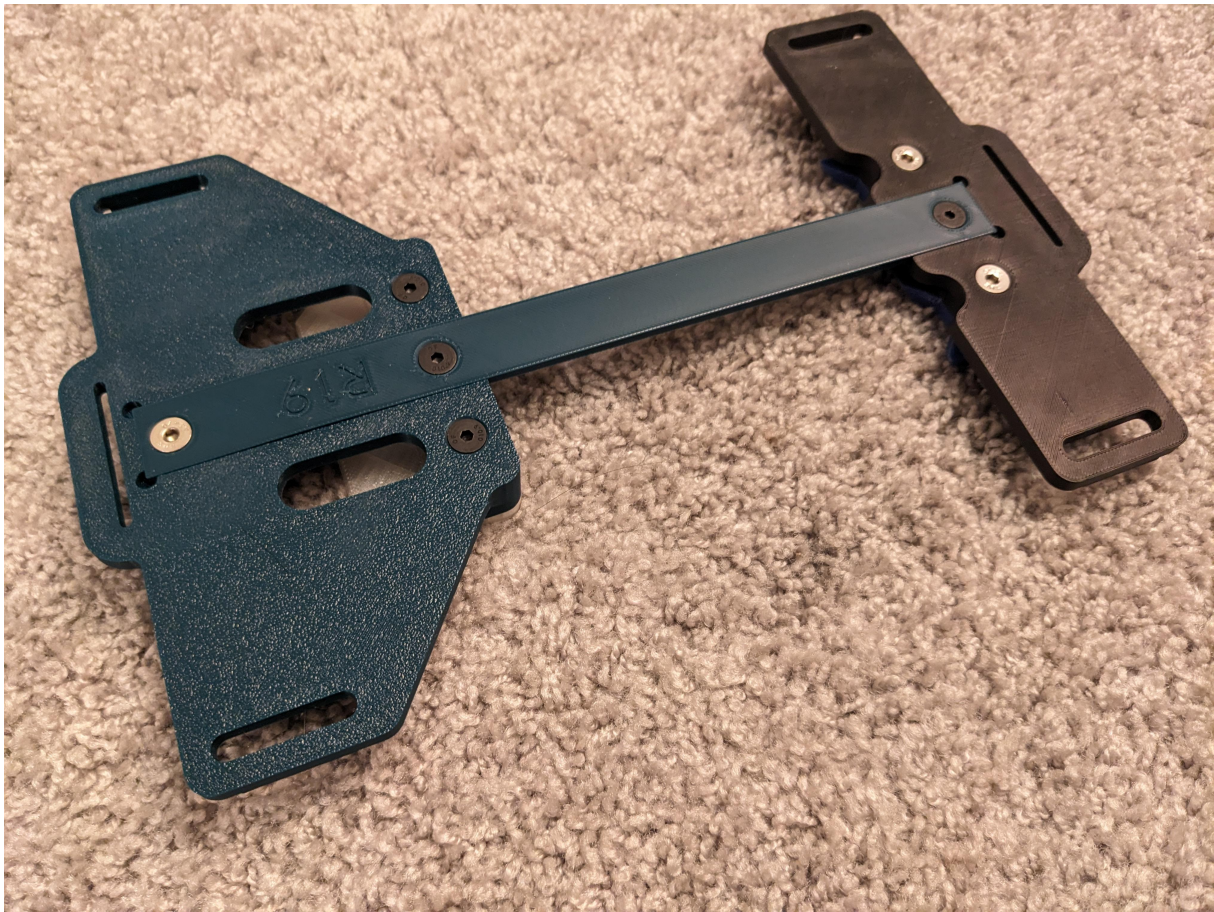
- I noticed I made the foot on the TIE DOWN, FRONT too short
 - oh well, I'll fix it when it breaks
 - it's supposed to be coplanar with the front JAW

- adding the spine, while it's still somewhat flexy
 - it appears that PA-CF from Bambu ought to be much better in regards to flexural modulus (AKA bending modulus)

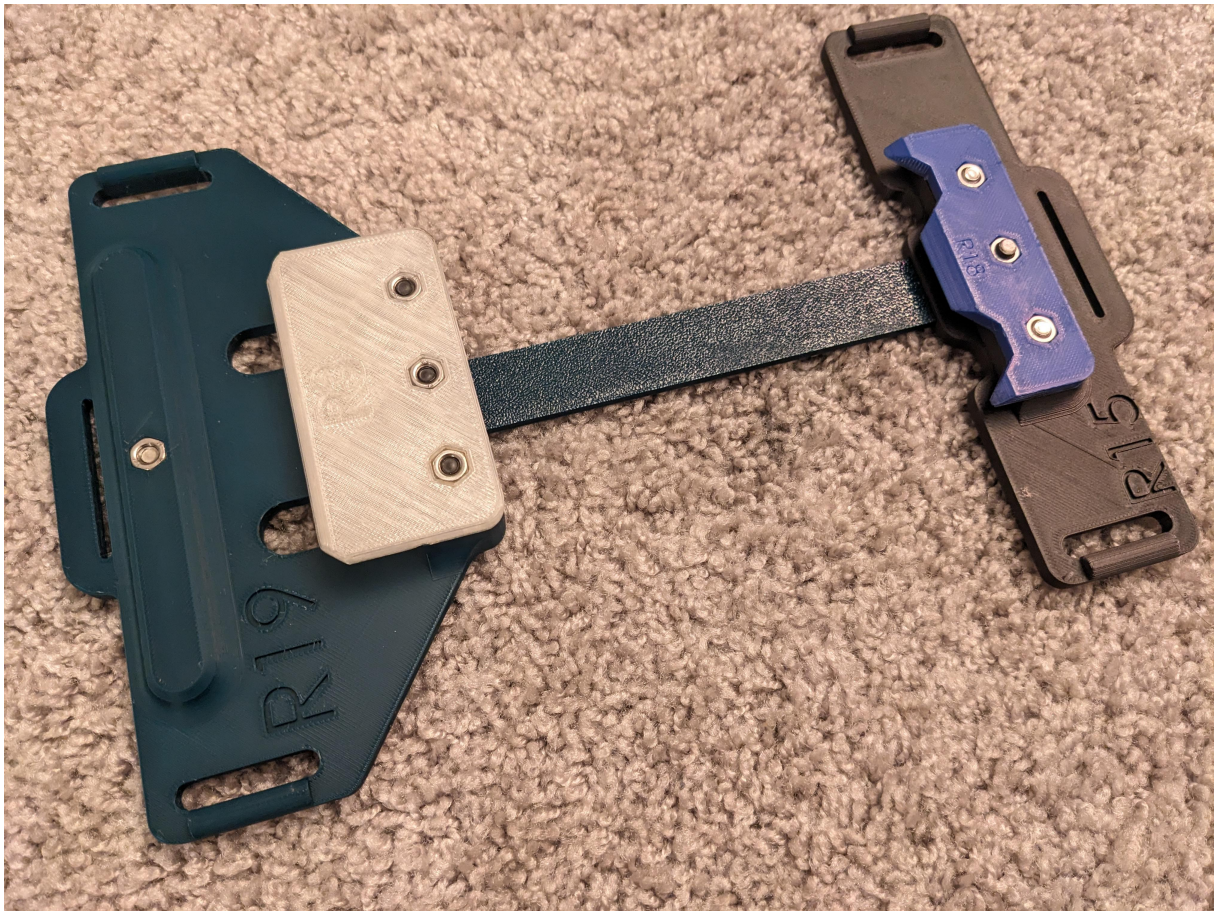
		PLA Shop now >	PA6-CF Shop now >
Filament Properties	Toughness Impact Strength - XY	26.6 kJ/m ²	40.3 kJ/m ²
	Strength Bending Strength - XY	76 MPa	151 MPa
	Stiffness Bending Modulus - XY	2750 MPa	5460 MPa
	Layer Adhesion Impact Strength - Z	13.8 kJ/m ²	15.5 kJ/m ²
	Heat Resistance HDT, 0.45 MPa	57 °C	186 °C
	Saturated Water Absorption Rate 25 °C, 55% RH	0.43%	2.35%

- again, I'll fix it when it breaks

Top view



Bottom view



Bottom view when mounted to the trunk bag



Side view, bottom



2024-04-02

- PLUG, R3 broke today
- was printed in PLA, finally broke when jumping down off a curb
 - 5% grid infill
- reprinting in PETG
 - 5% gyroid infill
 - should've been grid, but it's too late to stop the print

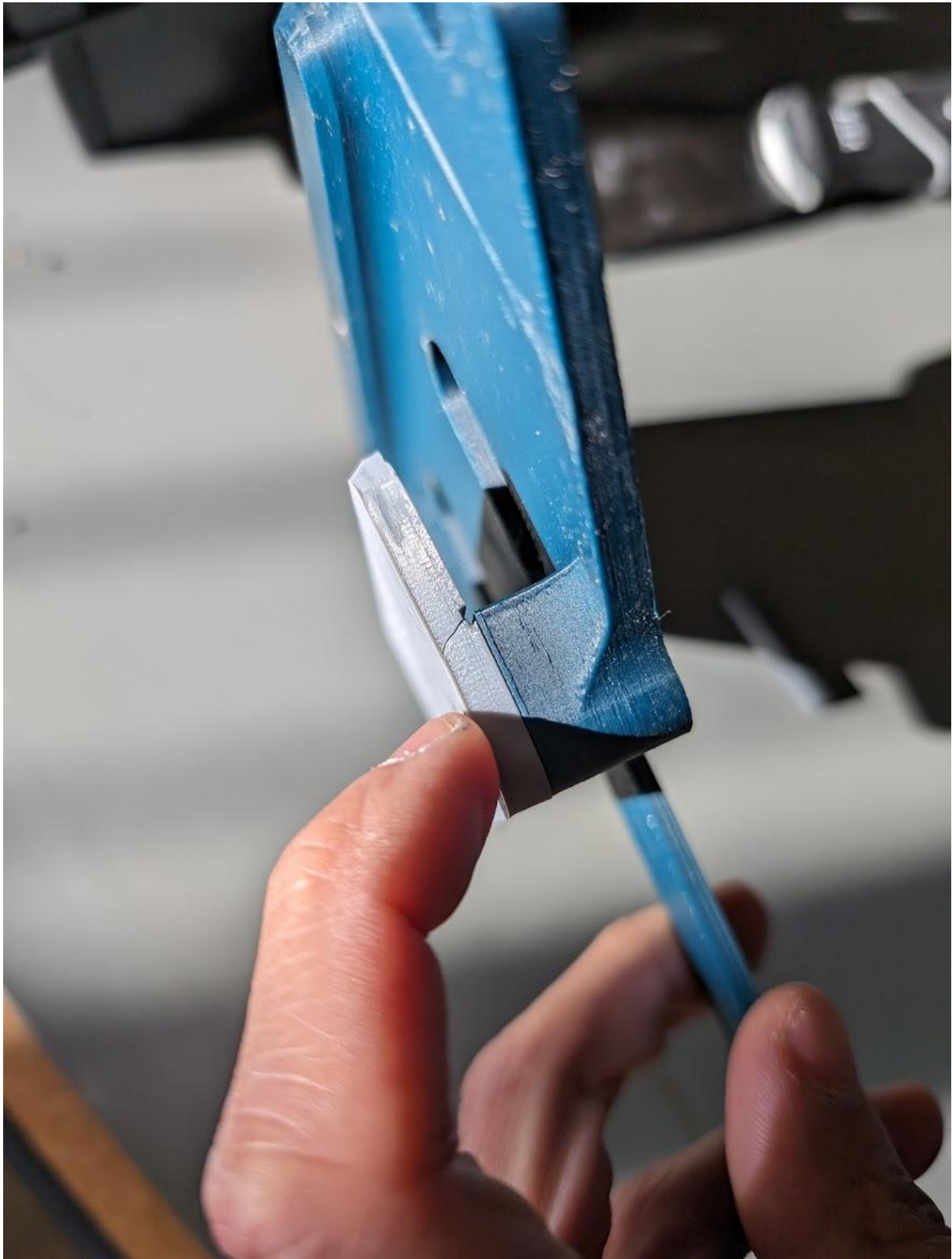


2024-04-16

- broke the PLUG after jumping off a curb







- created a revision 19 of the PLUG which removes the channel that was originally included so as to not overconstrain the joint, but in practice generated too much of a stress riser
 - HIPS filament printed on Ultimaker S3



Model files



3DP

4 files



receptacle-snap_r18__v.3mf



jaw-rear_r18__v.3mf



jaw-rear_r18__v.stl



receptacle-snap_r18__v.stl

platform-aventon-rack_r18.sldprt

receptacle-snap_r18.sldprt

asm-carrier_r18.sldasm

asm-rack-mounted-hardware_r18.sldasm

skeleton-trunk-bag-adapter-quick-release_r18.sldprt

jaw-rear_r18.sldprt

spine_r18.sldprt

asm-trunk-bag-adapter_r18.sldasm

tie-down-rear_r18.sldprt

tie-down-front_r18.sldprt

plug_r19.sldprt

Other files

centre-center-release-buckle20210205-20264-10bf0xm.zip

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