

# COVID-19 RESPONSE

# IAA VIRTUAL TOWN HALL

*3D Printing for PPE Fabrication*



## TOWN HALL AGENDA

1. 2:00 – 2:05pm Welcome  
Etiquette Reminder  
Presenter Introductions
2. 2:05 – 2:25pm Amanda Behr
3. 2:25 – 2:45pm David Robinson
4. 2:45 – 3:05pm Beatrice Robichaud
5. 3:05 – 3:25pm Dr. Gerald T. Grant
6. 3:25 – 3:40pm Q & A and Discussion
7. Closing – Thank you to our presenters and attendees!

# DAVID ROBINSON, CCA

Contact Info: [david@functionalrestorations.com](mailto:david@functionalrestorations.com)



## Certified Clinical Anaplastologist

Functional Restorations, Durham, North Carolina, USA

### Bio

David Robinson has spent the majority of his nearly 20 year career collaborating with orthotists and prosthetists to create unique functional and aesthetic silicone prostheses. His background includes orthotic and prosthetic fabrication, high realism silicone restoration, upper and lower limb silicone interfaces, and pedorthics.

### Relevant Experience

- Anaplastology
- O&P
- 3D Modeling & Printing
- Clinical Practice – Private and Institutional

## David Robinson, BA, CCA, CFo – Functional Restorations, Inc. – Durham, North Carolina

### Face Shields

- Cover the eyes, nose, and mouth, as well as helps you from touching your face. We know that COVID-19 is spread by droplets, such as from a cough or sneeze, so using face shields helps protect us from these infectious droplets.
- Help reduce the risk of asymptomatic spread
- Study has shown “wearing a face shield can reduce the inhalational exposure of the [wearer] by 96% in the period immediately after a cough.” (Lindsley WG1, Noti JD, Blachere FM, Szalajda JV, Beezhold DH. Efficacy of face shields against cough aerosol droplets from a cough simulator. Health Effects Laboratory Division, National Institute for Occupational Safety and Health , Morgantown , West Virginia. 2014; <https://www.ncbi.nlm.nih.gov/pubmed/24467190>)


### Face Masks

- **Surgical Masks** - A loose-fitting disposable mask that protects the wearer's nose and mouth from contact with droplets, splashes and sprays that may contain germs. A surgical mask also filters out large particles in the air. Surgical masks may protect others by reducing exposure to the saliva and respiratory secretions of the mask wearer.
- **N95 Masks** - Offers more protection than a surgical mask does because it can filter out both large and small particles. The name indicates that the mask is designed to block 95% of very small particles. Like surgical masks, N95 masks are intended to be disposable.

# PRUSA 3D – FACE SHIELD: <https://www.prusa3d.com/covid19/>

Original Prusa MINI is here! Smart and compact 3D printer for everyone! Just 349 USD / 379 EUR (VAT incl.)

**PRUSA**  
RESEARCH  
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## 3D PRINTED FACE SHIELDS FOR MEDICS AND PROFESSIONALS


OPEN-SOURCE FACE SHIELDS ANYONE WITH A 3D PRINTER CAN HELP PRODUCING. JOIN THE COMMUNITY-DRIVEN EFFORT TO HELP PROFESSIONALS IN YOUR AREA.


In reaction to the acute shortage of protective wear for medical personnel in the current pandemic situation, we have quickly developed and started to mass-produce protective face shields. We have already **printed and donated over 65.000 shields** to medics and other professionals in the Czech Republic and we have requests for **80.000 more** (numbers to 13th March 2020).

But the shortage is global and **everyone with a 3D printer can help!** 3D printing communities across the world became a massive driving force in the effort to produce protective wear for those, who need it the most.


**This is why the design of the shields is fully open-source**, anyone can produce it and/or modify it. Also, the shields are made from easily accessible and inexpensive materials. We would like to ask you to **help us by spreading the word** or even joining the collective endeavor - as a community, we can help thousands of people in need.

Reach out to institutions in your local area and ask them if they could use some additional protective wear (chances are they definitely could!). It's **not only about hospitals** and other first responders like police officers and firemen, but also **nursing homes, dentists, or just grocery store staff** - simply put, you could offer your help to all those who now have to stay in the service or be in contact with many other people in the time of crisis.







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**ASSEMBLY  
MANUAL**  
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manual to learn more.](#)




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FORUM**  
[Have a question? Join  
our community!](#)



**WATCH THE  
ASSEMBLY VIDEO**  
[See the assembly video  
for detailed instructions.](#)



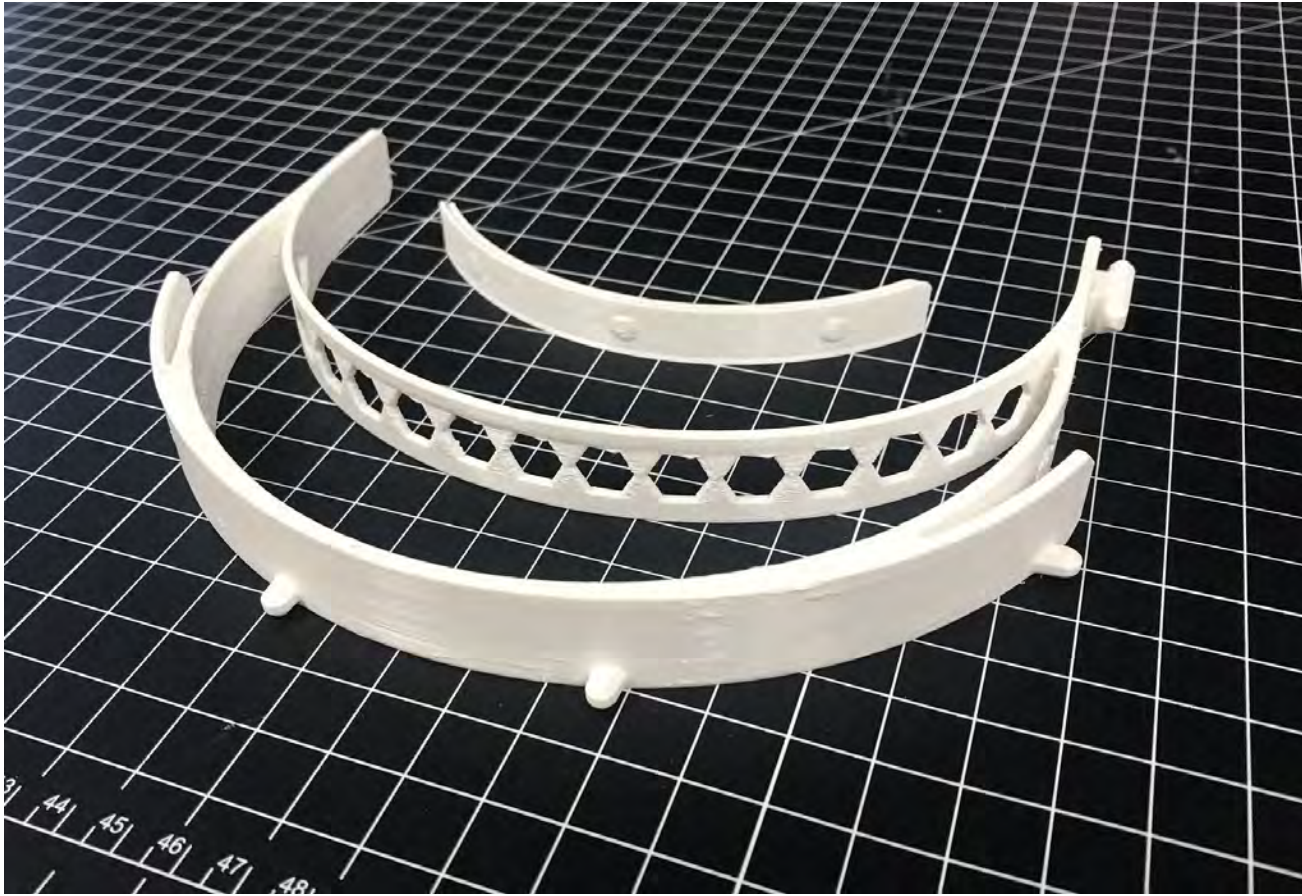
**STERILIZATION  
GUIDE**  
[Stay safe! Learn how to  
sanitize the shields.](#)



**MORE ABOUT  
PROJECT**  
[Learn more about the  
project on our blog!](#)



PRUSA 3D – FACE SHIELD: <https://www.prusa3d.com/covid19/>



# AIRWOLF 3D – FACE SHIELD: <https://airwolf3d.com/2020/03/27/covid-19-face-shield-3d-printable-file/>

**AIRWOLF3D®** SHOP ▾ SUPPORT TESTIMONIALS SAMPLE PARTS INDUSTRIES ▾ SOFTWARE RESOURCES ▾ **BLOG** Q

Home » Blog » COVID-19 Face Shield 3D Printable File

BLOG

## COVID-19 Face Shield 3D Printable File

POSTED ON MARCH 27, 2020 BY ERICK WOLF



### How to help

Thank you for reaching out with offers of support concerning the Covid-19 pandemic. The Airwolf 3D community has a unique opportunity to help due to our larger bed platforms and robust material options. As such we have been working with medical professionals to evaluate various protective devices. To date, we



# AIRWOLF 3D – FACE SHIELD: <https://airwolf3d.com/2020/03/27/covid-19-face-shield-3d-printable-file/>

**Cura** Prepare Monitor

Solid view

Artemis 300

Extruder 1 Extruder 2

Material PLA

Check compatibility

Print Setup Recommended Custom

Profile: Duramic3D PETG\_02mmLayer\_30In

Search...

**Quality**

Layer Height	0.3	mm
Initial Layer Height	0.3	mm
Line Width	0.7	mm
Wall Line Width	0.7	mm
Outer Wall Line Width	0.7	mm
Inner Wall(s) Line Width	0.7	mm
Top/Bottom Line Width	0.7	mm
Infill Line Width	0.7	mm
Skirt/Brim Line Width	0.7	mm
Initial Layer Line Width	100.0	%

**Shell**

Wall Extruder	Not overrid...
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Ready to Save to Removable Drive

CFDMP\_COVID\_19\_HEADBAND\_AW1\_DOUBLE

241.5 x 223.8 x 20.0 mm

03h 44min

34.91m / ~ 104g

Save to Removable Drive

# AIRWOLF 3D – FACE SHIELD: <https://airwolf3d.com/2020/03/27/covid-19-face-shield-3d-printable-file/>

**CURA**

PrepareMonitor

Solid View

LulzBot TAZ 6 Aerostruder

CategoryAll

MaterialPETG (IC3D)

Use glue stick.

Adhesion Info

ProfilePETG (PRO Series)\_FACE SHIELD

Print Setup

RecommendedCustom

Search...

Quality

Layer Height	0.3	mm
Initial Layer Height	0.38	mm
Line Width	0.5	mm
Wall Line Width	0.5	mm
Outer Wall Line Width	0.5	mm
Inner Wall(s) Line Width	0.5	mm
Top/Bottom Line Width	0.5	mm
Infill Line Width	0.5	mm

Ready to Save to File

04h 59min  
10.63m / ~ 81g

Save to File

LTAZ6A\_COVID\_19\_HEADBAND\_AW1\_DOUBLE  
241.5 x 223.8 x 20.0 mm



# AIRWOLF 3D – FACE SHIELD:

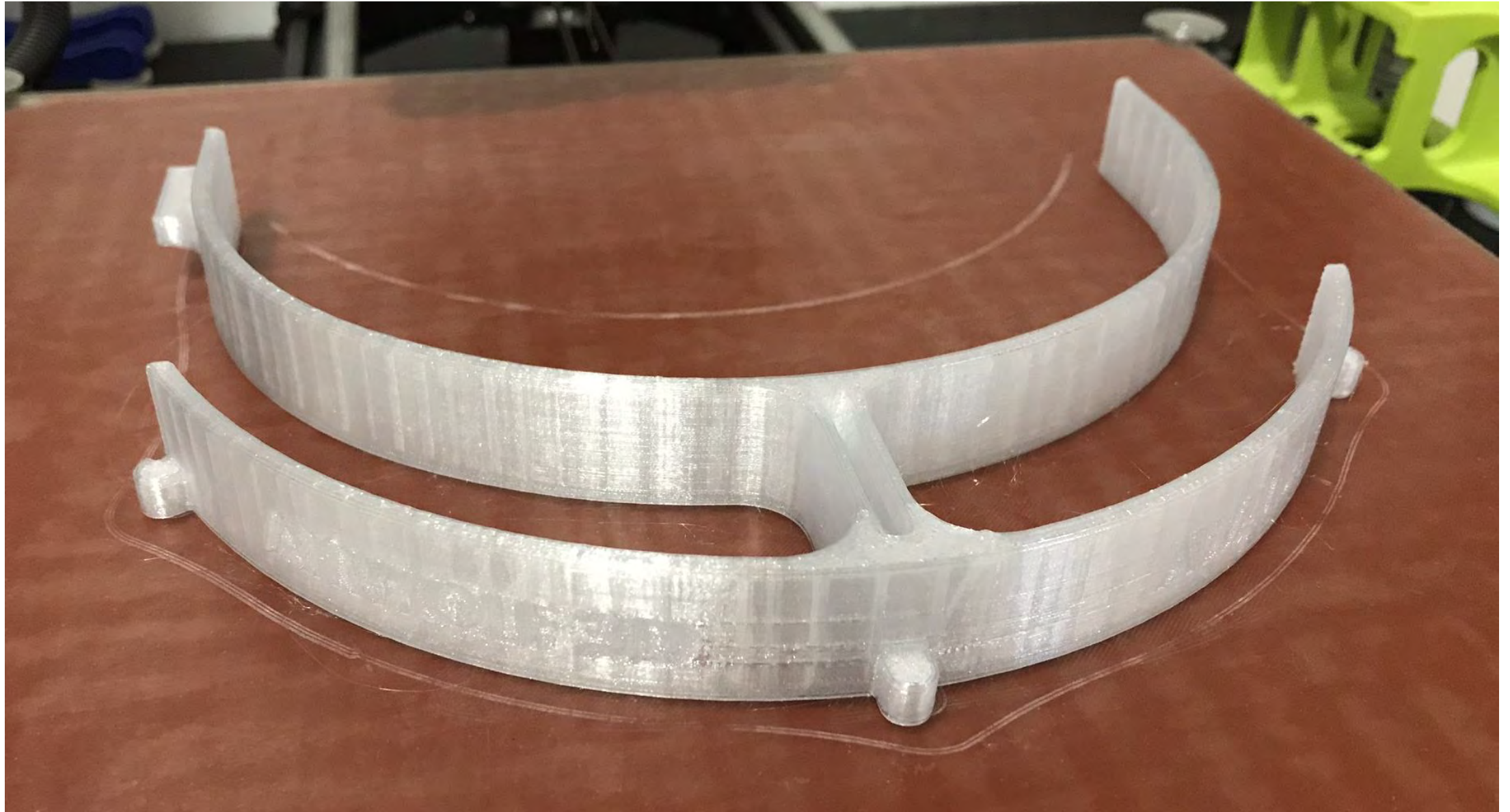
## PETG FILAMENT BRANDS / FDM PRINTER MODEL / SLICER SETTINGS

### DURAMIC

### MATTERHACKERS PRO SERIES

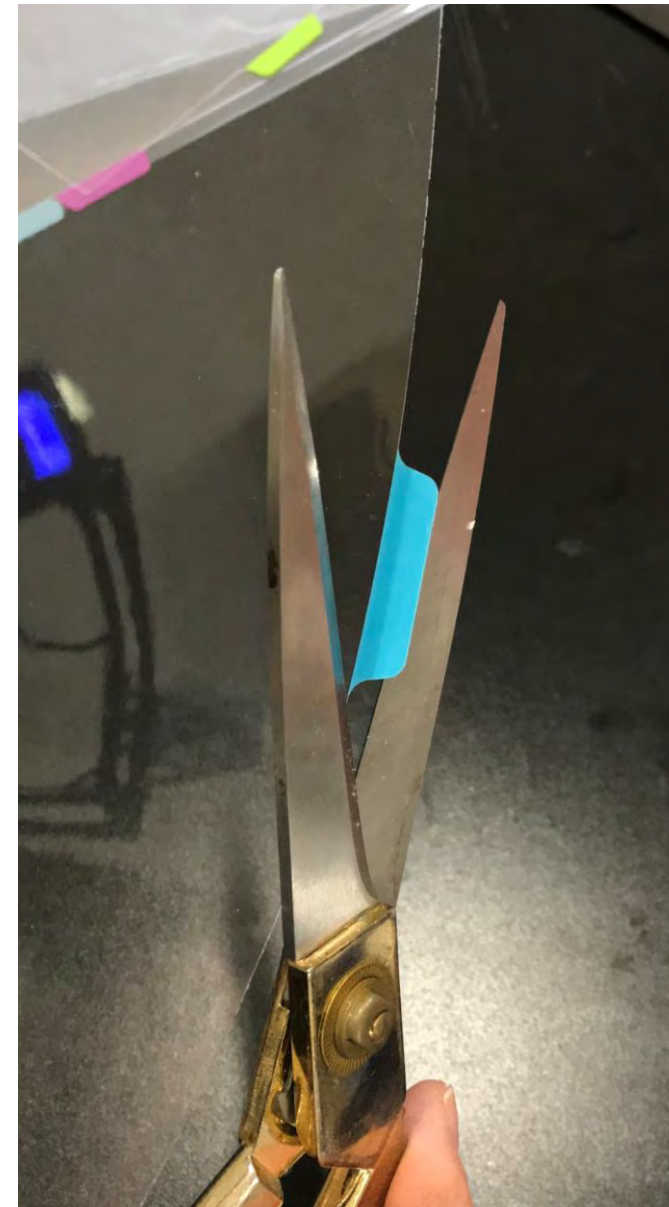
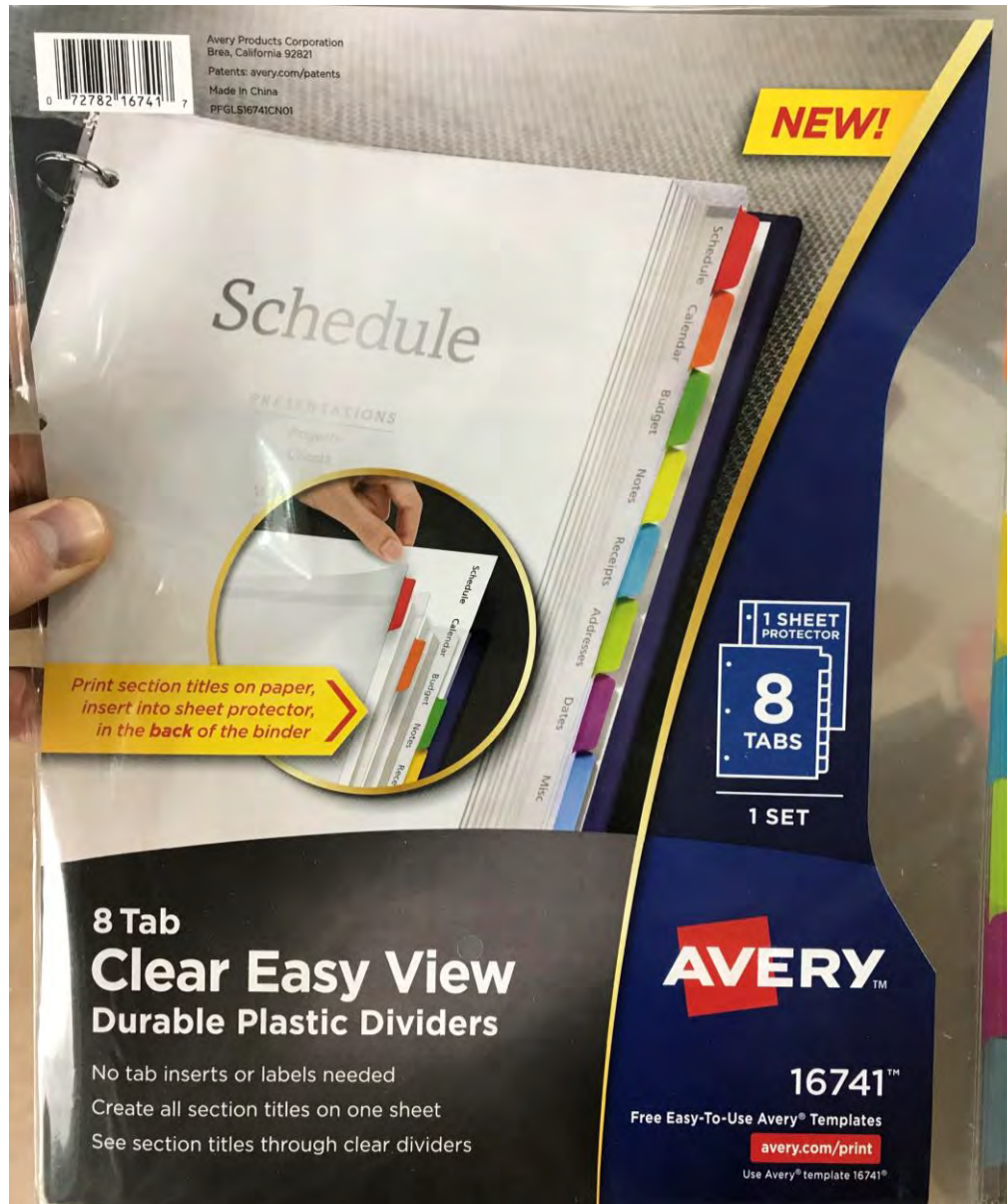
3D PRINTER	Artemis 300 (SeeMeCnC)	Taz 6 (Lulzbot)
NOZZLE SIZE	0.7mm	0.5mm
NOZZLE TEMPERATURE	245°C	240°C
BED TEMPERATURE	60°C	65°C
LAYER HEIGHT	0.3mm	0.3mm
WALL LINE COUNT	2	2
TOP/BOTTOM LAYERS	3	3
INFILL DENSITY	25%	20%
INFILL PATTERN	CUBIC	CUBIC
PRINT SPEED	45mm/sec	40mm/sec
APPROXIMATE PRINT TIME	3hrs 45min	5hrs

## AIRWOLF 3D – FACE SHIELD:



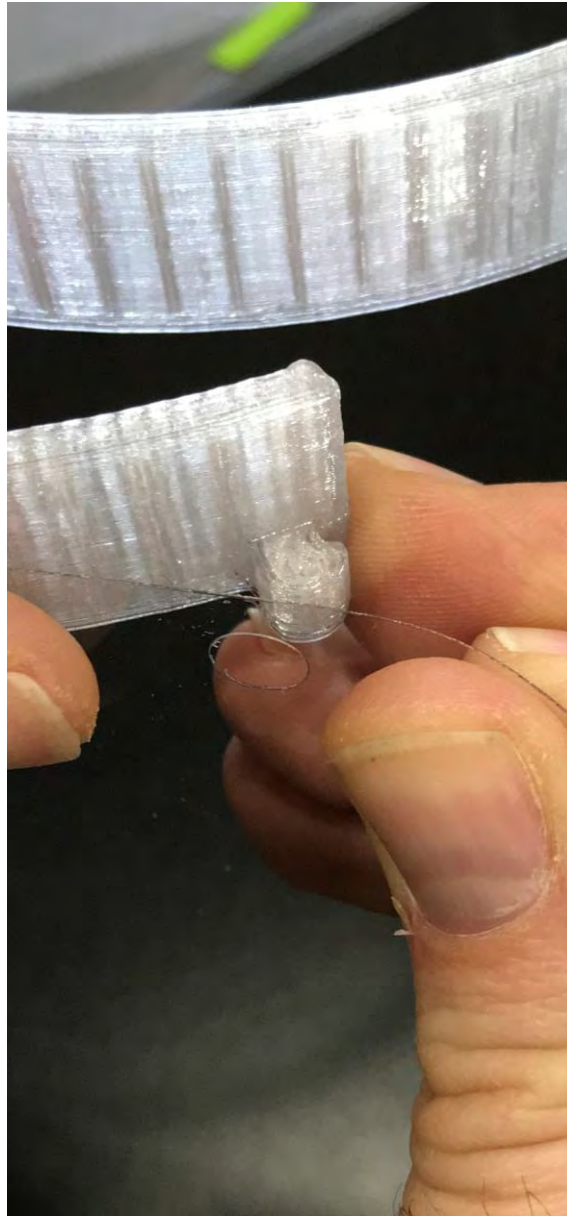
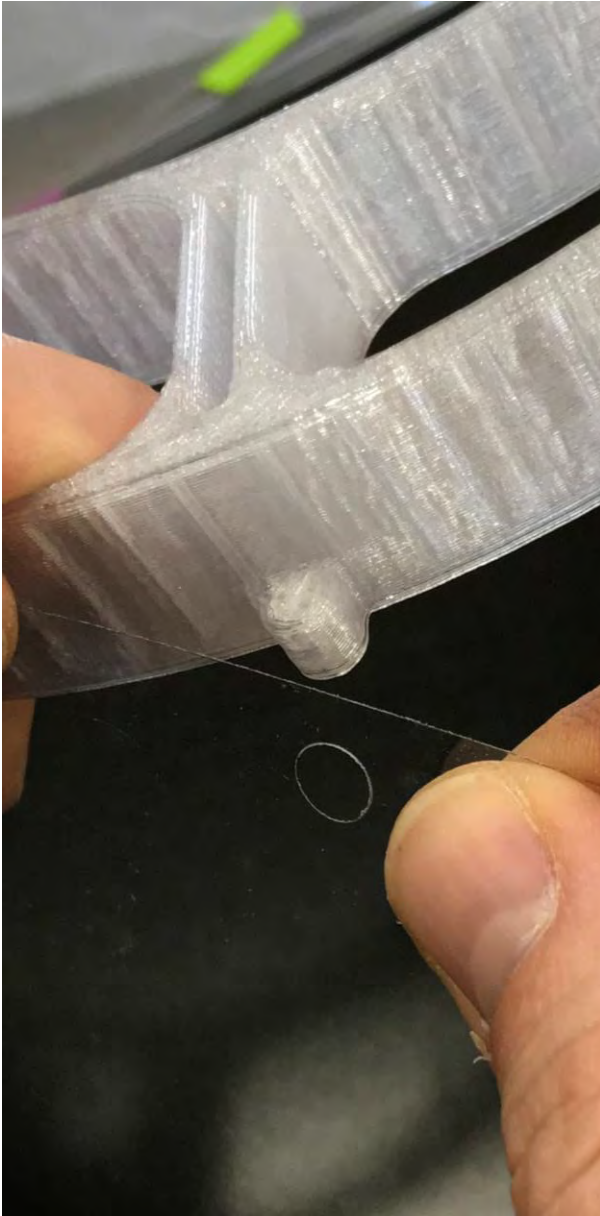


# AIRWOLF 3D – FACE SHIELD:



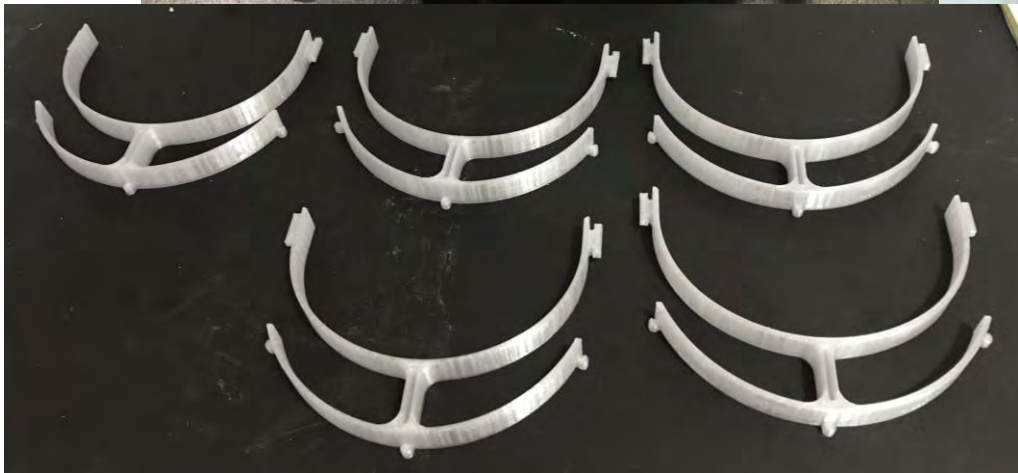
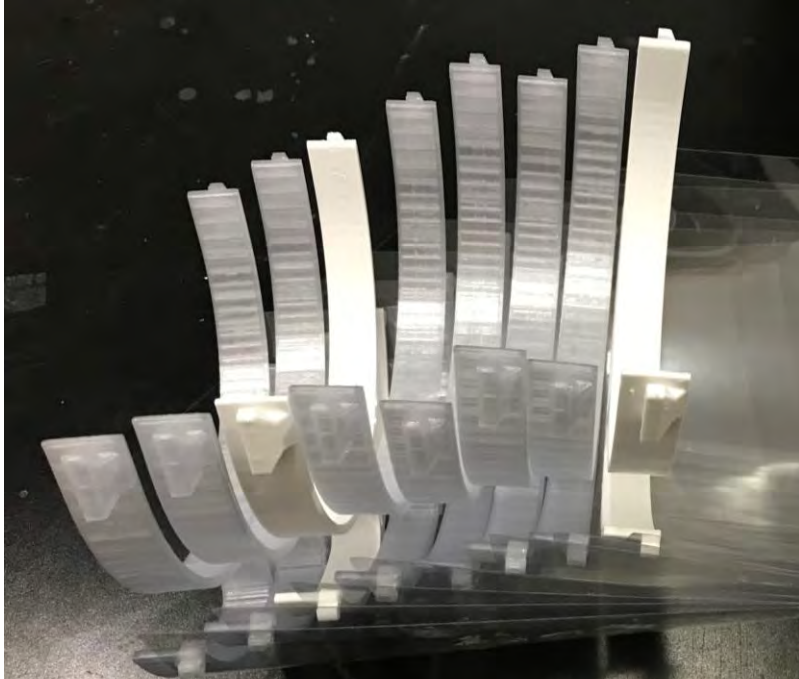


## AIRWOLF 3D – FACE SHIELD:





## AIRWOLF 3D – FACE SHIELD:



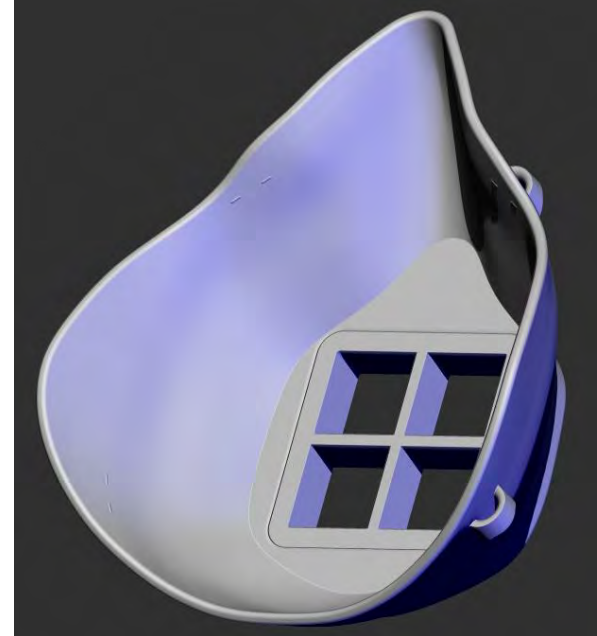
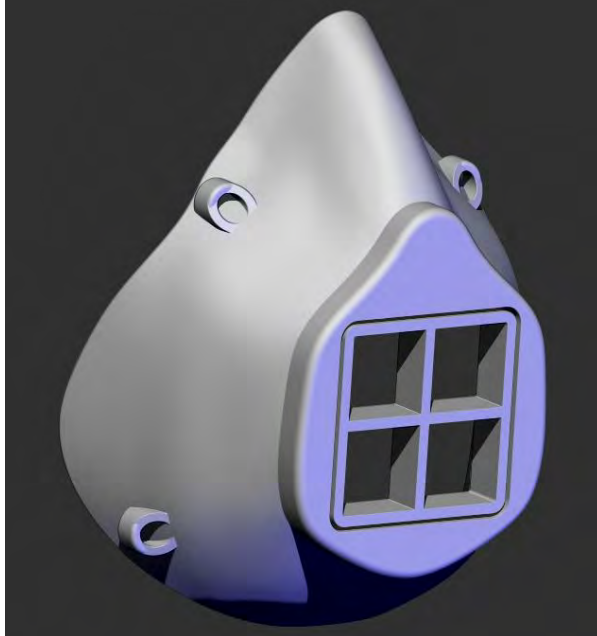
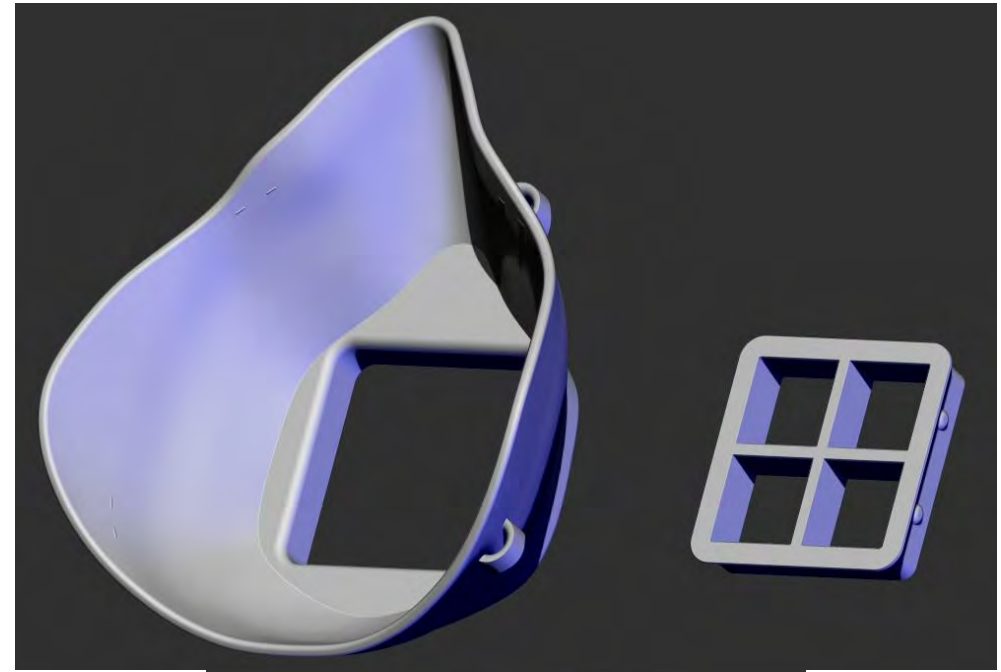
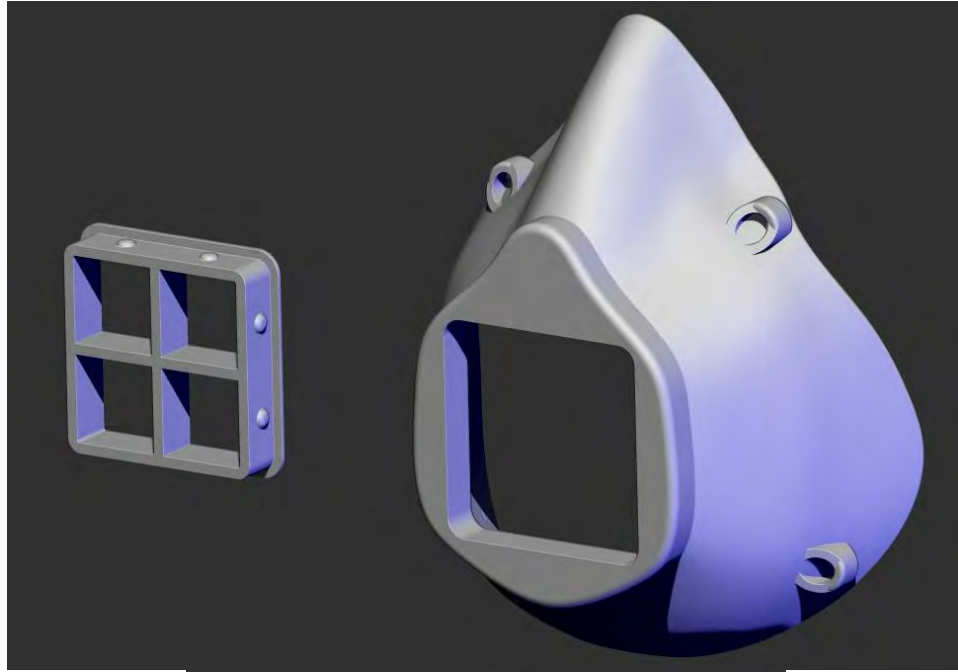
# THE MONTANA MASK: 3D printed mask designed to extend supply of N95

- Not FDA or NIOSH approved, BUT this mask has been tested “rigorously”
- The CDC has recently approved “homemade masks” for crisis management and shortages of approved materials.
- This is **not an FDA or NIOSH approved N95** product and should be tested and fit to your local hospital standard.
- Using 2.5” squares cut from surgical masks, one N95 surgical mask will yield six filters.





# THE MONTANA MASK: 3D printed mask designed to extend supply of N95



# THE MONTANA MASK: Gasket Assembly – Adhesive backed weatherstripping

**Lowe's** Find a Store near me >

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Windows & Doors > Weatherstripping

Item # 127945 Model # 63628  
M-D 17-ft x 5/16-in White Window Seal Rubber Window Weatherstrip

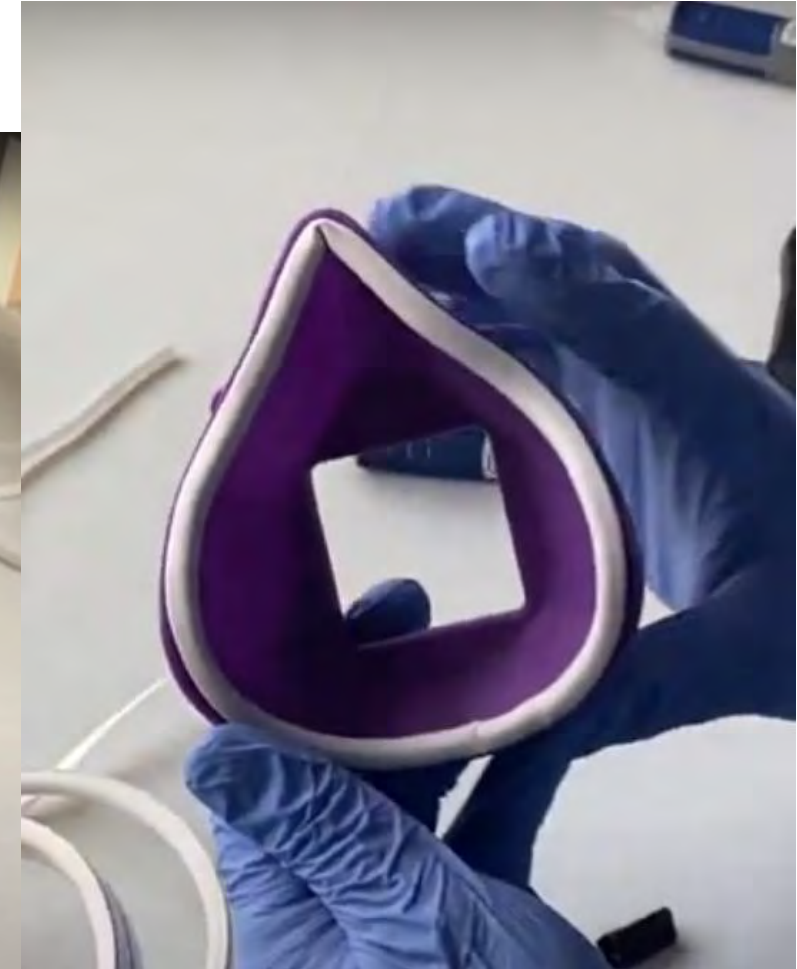
166 Ratings  
★★★★☆  
4.4 Average

89%  
Recommend this product

Community Q&A  
View Now



+1 More



[https://www.youtube.com/watch?v=UkYnSPlj7AI&feature=emb\\_rel\\_end](https://www.youtube.com/watch?v=UkYnSPlj7AI&feature=emb_rel_end)



# MONTANA MASK: FLEXIBLE TPU (NinjaTek – Cheetah: 95A)



- In comparison to PLA, ABS, PETG and other rigid 3D printed masks, a flexible TPU print can reduce or eliminate the need to heat form the mask in order to adjust the fit.
- **Keep in mind – any modification to the original design of The Montana Mask “will void the associated research and require a complete workup of testing.”**



## CURA

Monitor



Solid View



## Experimental

Cheetah (NinjaTek)

Use glue stick with PEI, or print directly on glass.



Cheetah - Face Mask - 0.200mm

Recommended

Custom

Search...

Quality

Layer Height		0.2	mm
Initial Layer Height		0.4	mm
Line Width		0.6	mm
Wall Line Width		0.6	mm
Outer Wall Line Width		0.6	mm
Inner Wall(s) Line Width		0.6	mm
Top/Bottom Line Width		0.6	mm
Infill Line Width		0.6	mm

04h 47min  
8.57m / ~ 65g

Save to File

LTAZ6A\_UMesh\_LondonMontanaMaskRemixV3

105.8 x 181.3 x 58.0 mm

MONTANA MASK: FLEXIBLE TPU (NinjaTek – Cheetah: 95A)

	<b>NINJATEK CHEETAH</b>
<b>3D PRINTER</b>	<b>Taz 6 (Lulzbot)</b>
<b>NOZZLE SIZE</b>	0.5mm
<b>NOZZLE TEMPERATURE</b>	225°C
<b>BED TEMPERATURE</b>	40°C
<b>LAYER HEIGHT</b>	0.2mm
<b>WALL LINE COUNT</b>	2
<b>TOP/BOTTOM LAYERS</b>	4
<b>INFILL DENSITY</b>	20%
<b>INFILL PATTERN</b>	GRID
<b>PRINT SPEED</b>	30mm/sec
<b>APPROXIMATE PRINT TIME</b>	<b>5hrs</b>

# THE MONTANA MASK – MODIFICATIONS: SILICONE OVERMOLD

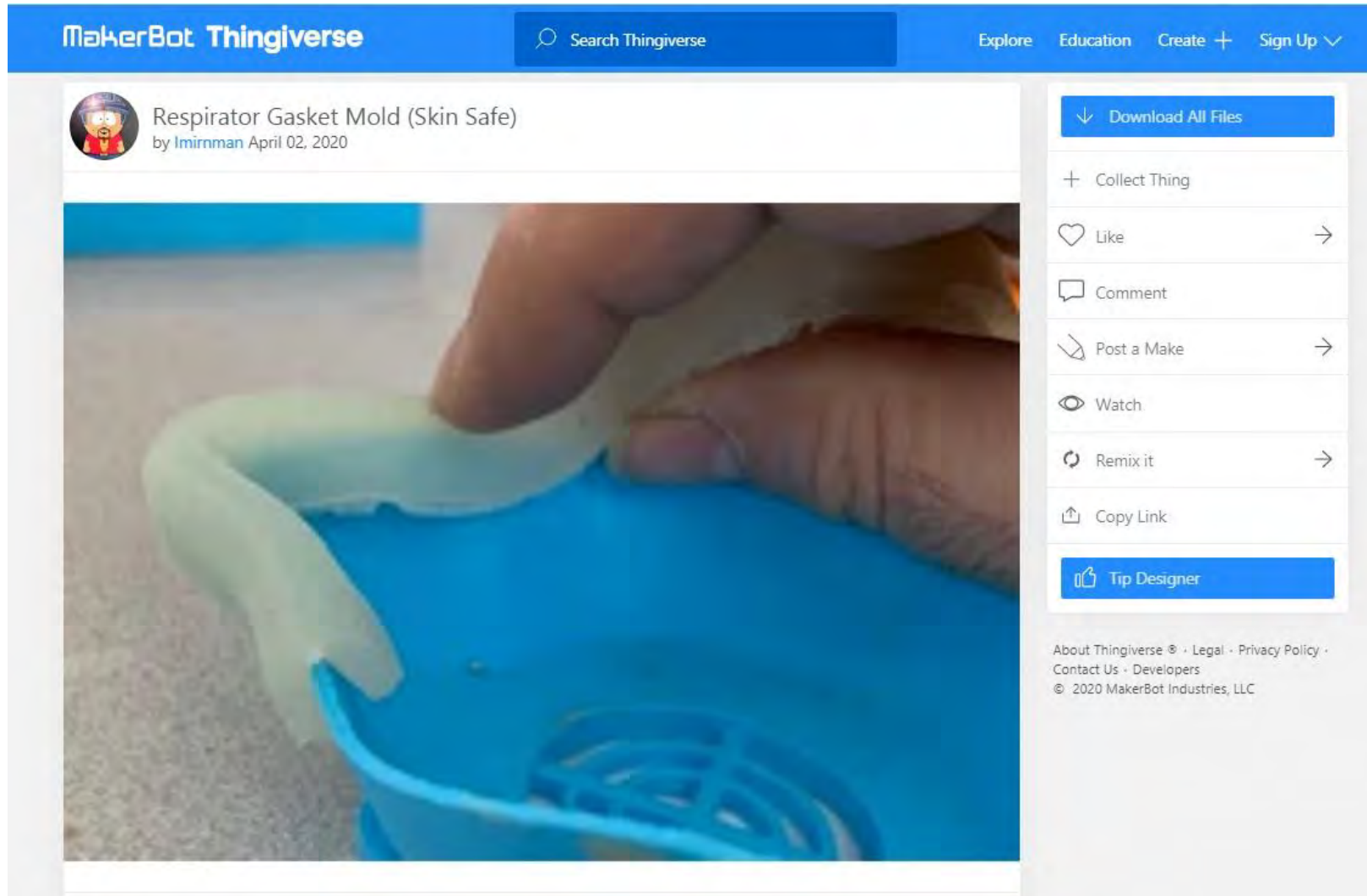


YouTube Channel: Bloq Builds (<https://www.youtube.com/watch?v=gjb0MPBActo&feature=youtu.be>)

- Based on Montana Mask design, with the addition of a 3D printable overmold. Designed to create a permanent silicone gasket to improve seal

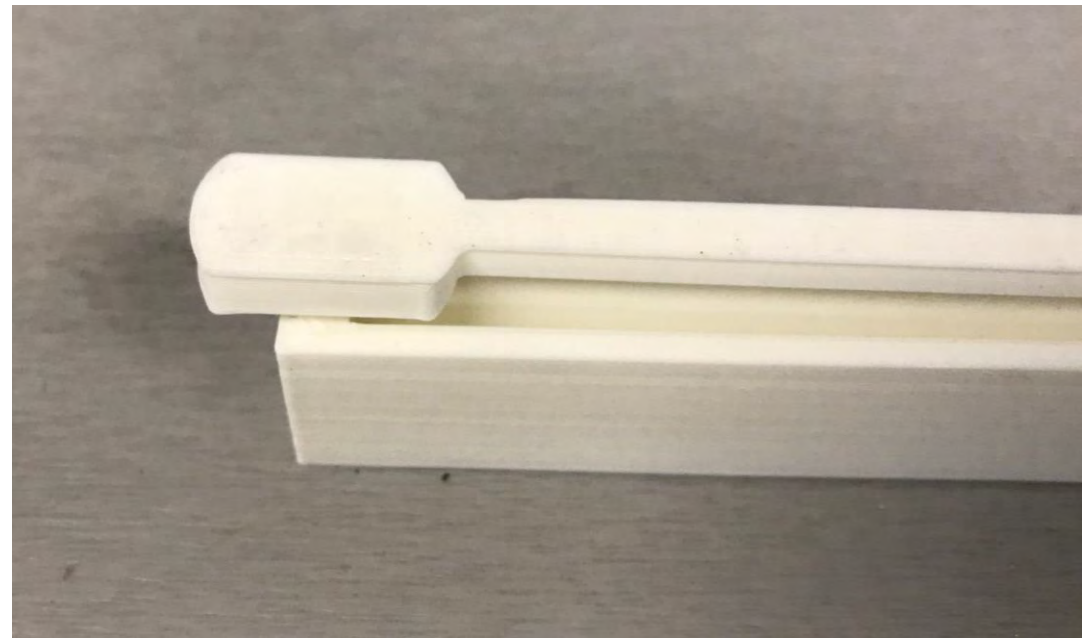
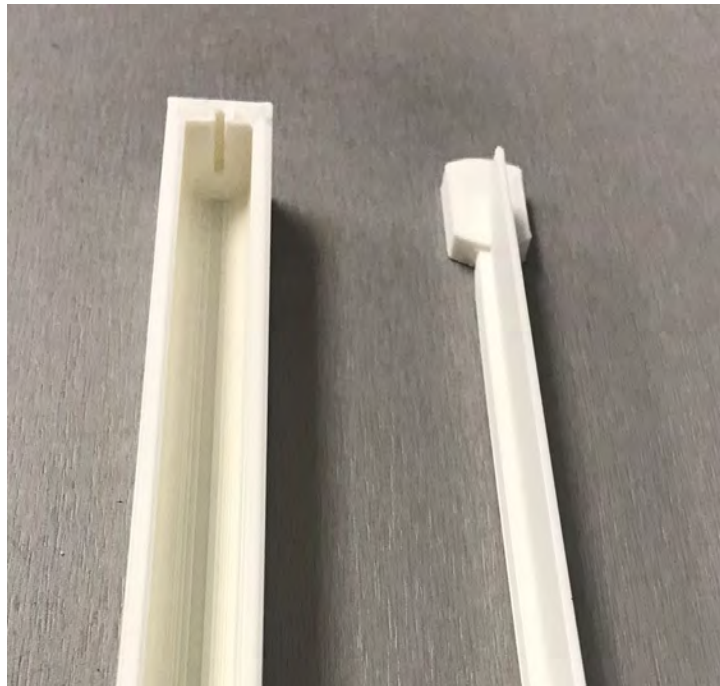
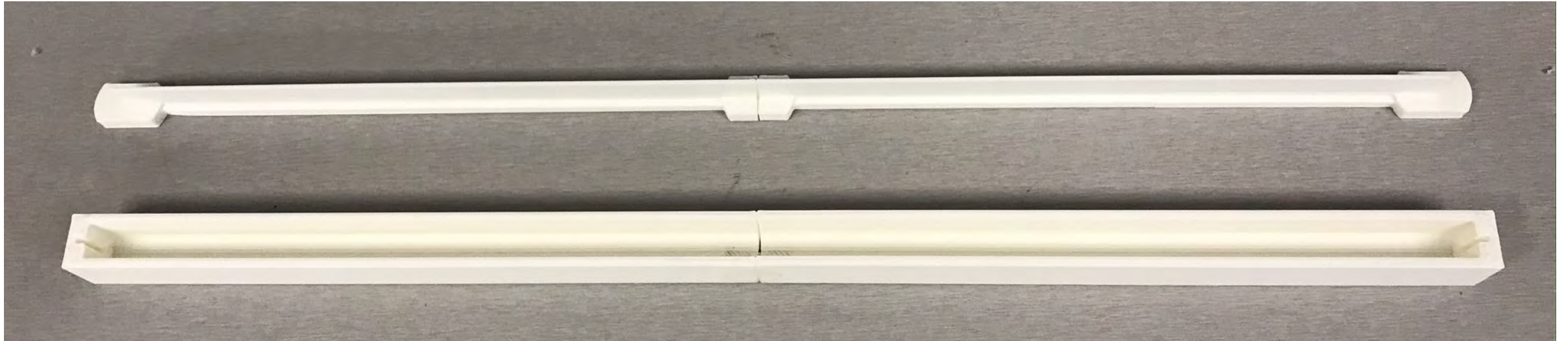


# MONTANA MASK ACCESSORY: 3D PRINTED MOLD FOR SILICONE GASKET



<https://www.thingiverse.com/thing:4256265>

# MONTANA MASK ACCESSORY: 3D PRINTED MOLD FOR SILICONE GASKET





# MONTANA MASK ACCESSORY: 3D PRINTED MOLD FOR SILICONE GASKET

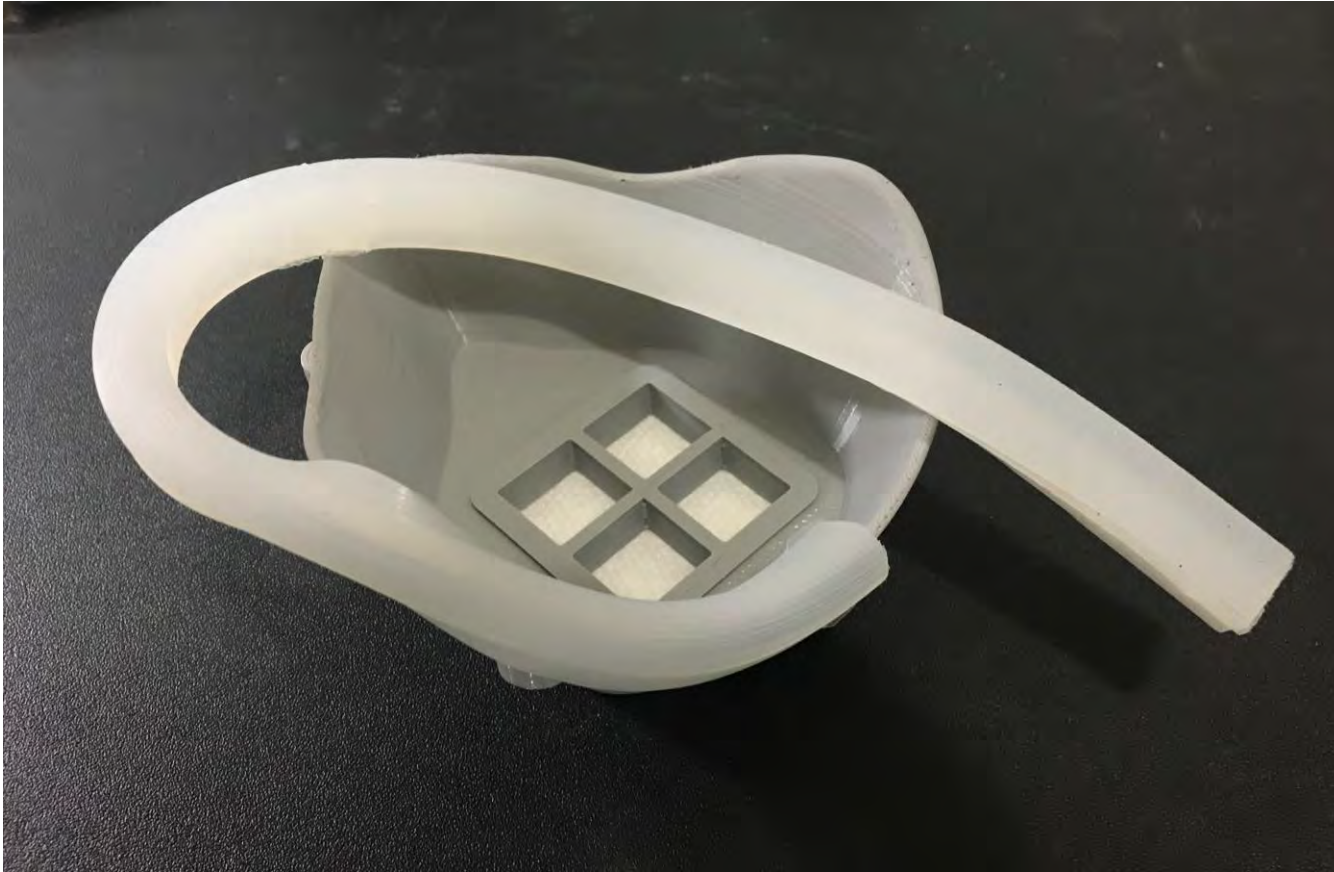


- Fill with a low durometer fast cure silicone, such as Ecoflex 5 (Smooth-On)





# MONTANA MASK - MODIFIED: FLEXIBLE TPU w/ SILICONE GASKET



- Adhere silicone gasket, using acetoxym adhesive (A-564, Sil-Poxy, etc.)
- Be sure to allow full cure before wearing mask
- Sanitizes more effectively than porous rubber weatherstripping




# MONTANA MASK ACCESSORY – CLASP HOOK: <https://www.thingiverse.com/thing:4261277>

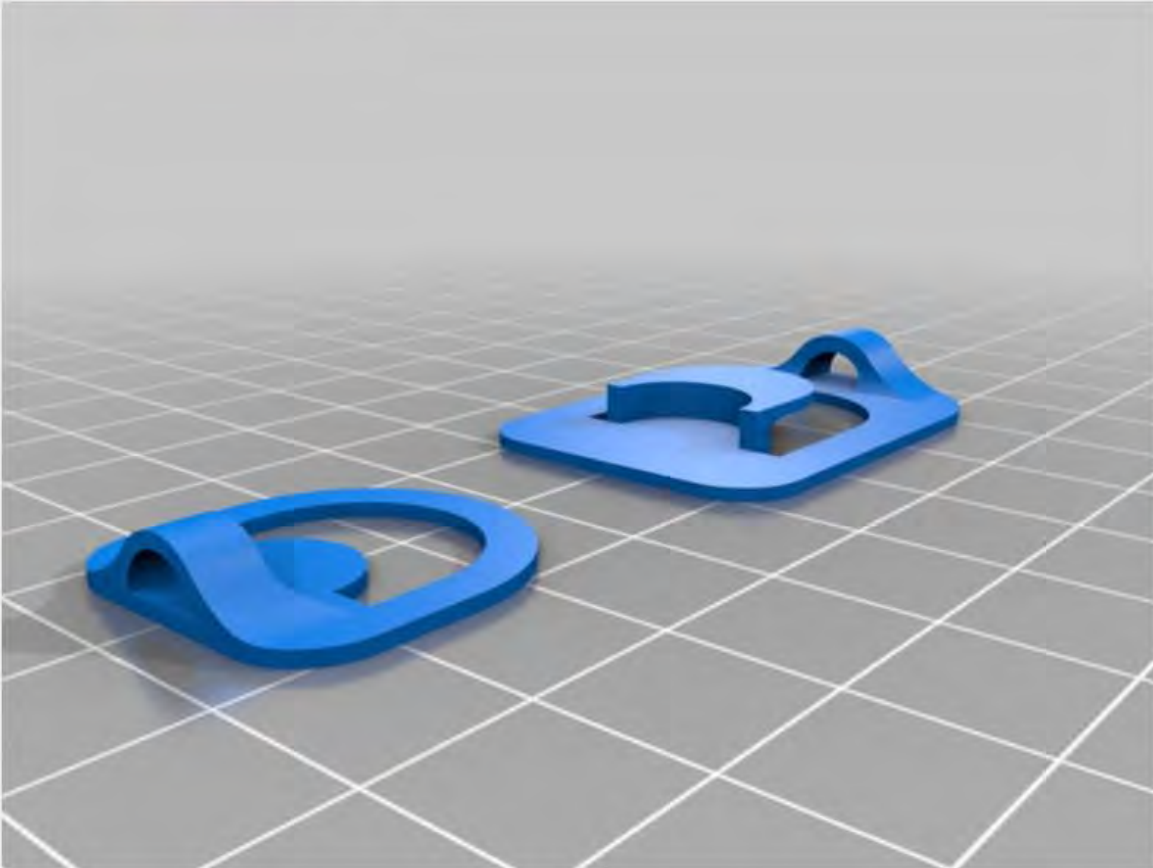
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**Filter Mask Clasp Hook**  
by [keep\\_hope\\_alive](#) April 04, 2020





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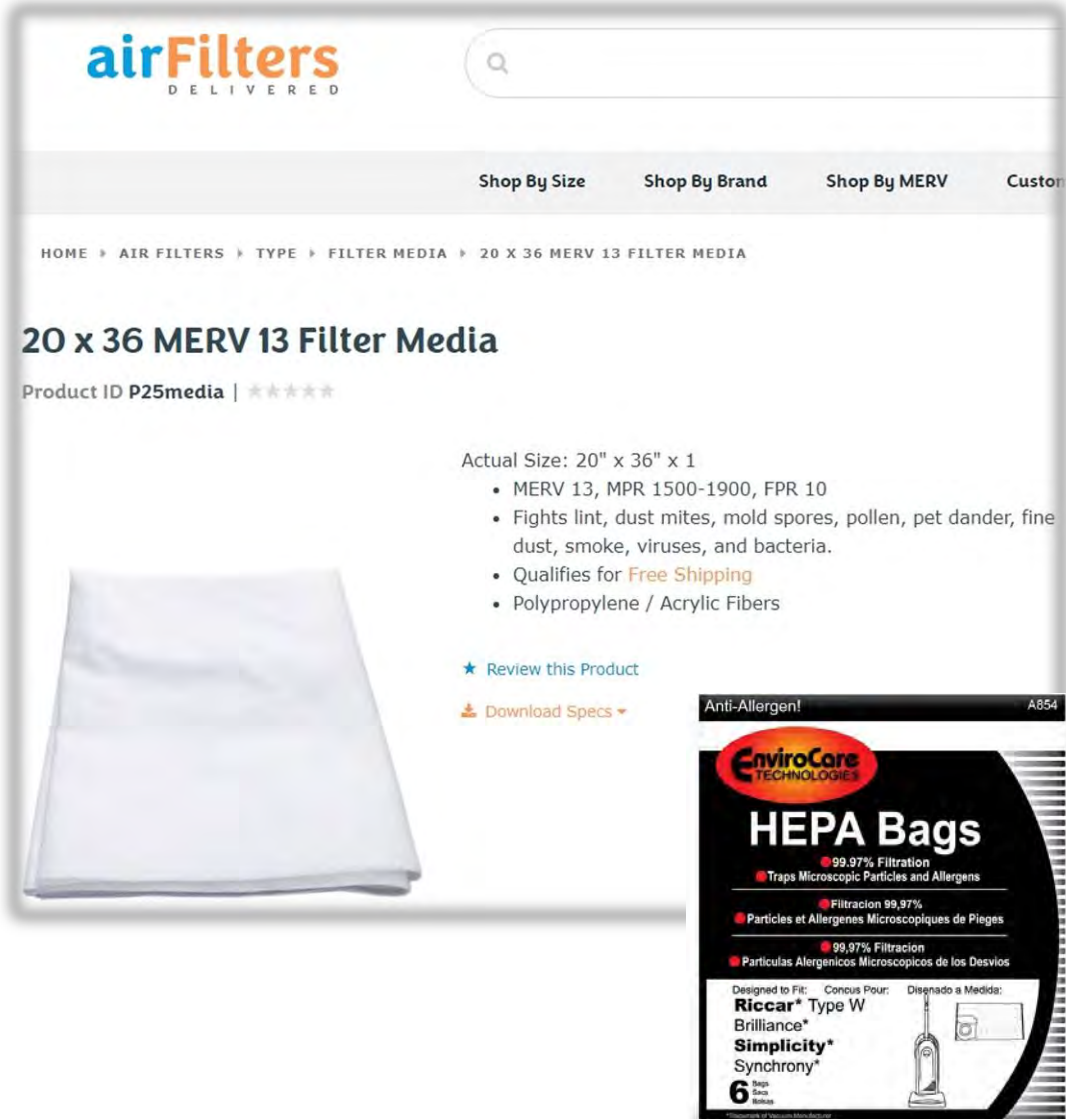
Tip Designer

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# SAFE, EFFECTIVE & ACCESSIBLE FILTER MATERIAL???



- HEPA vacuum bags?
- HVAC filters? – High MERV (Minimum Efficiency Reporting Value) filters are typically made of polyester or cotton paper
  - Statement by 3M (maker of Filtrete™ brand HVAC filters):  
“Altering any of our 3M Filtrete™ Air Filters is not recommended or supported by 3M or the Filtrete™ Brand.”
  - The online company [Air Filters Delivered](https://www.airfiltersdelivered.com) is selling MERV-13 filter fabric for use in coronavirus masks. They even have a page with [instructions on how to make your own coronavirus mask](https://www.airfiltersdelivered.com/instructions-on-how-to-make-your-own-coronavirus-mask) with a pocket that can hold a tissue or a piece of HVAC filter fabric. (source - <https://www.energyvanguard.com/blog/can-you-use-hvac-filters-coronavirus-masks>)
- **FIBERGLASS**, polypropylene, coffee filters?
- Breathability - “Low breathing resistance”

