Satin liner for cloth face masks (with cup effect to increase surface area for air-filtering) v2

- **Using cloth masks does <u>not</u> reduce the supply of <u>surgical masks</u> for medical professionals**
- Cloth masks are **not at all as good as** surgical, N95, or FFP1/2/3 masks for filtering anything out of the air the wearer would breathe in.
- Satin has "low porosity" which may be good for filtering.
- This mask (with a satin liner) has been worn for trips out of the home since 2nd March
- The liner takes 45 mins to make for a pre-existing cloth mask
- Satin, velcro dots, scissors, chalk, copper-wire or plastic placemat, sewing machine (or needle and thread) needed.

This was the mask purchased online. It's stretchy and of a polyester/cotton mix.

This guide adds a satin liner for extra air filtering

Here I mark the location of the velcro dots, and the metal nose clip that I threaded into the hem, that I had unpicked in order to do that, then re-sewn:


Red = top

Blue = bottom

The nose clip wire should be plastic coated for eye-safety and pliable to some degree while holding its shape. You can use a few "twisties" if you have them.

The outer mask placed correctly on the wearer's face with a square of paper underneath, and a pencil line drawn on that to show the top edge only of the outer mask:


This paper piece is going to be a template for the satin liner

The paper taken off the face still in 3D, with the top of the template for the satin liner marked in pen:
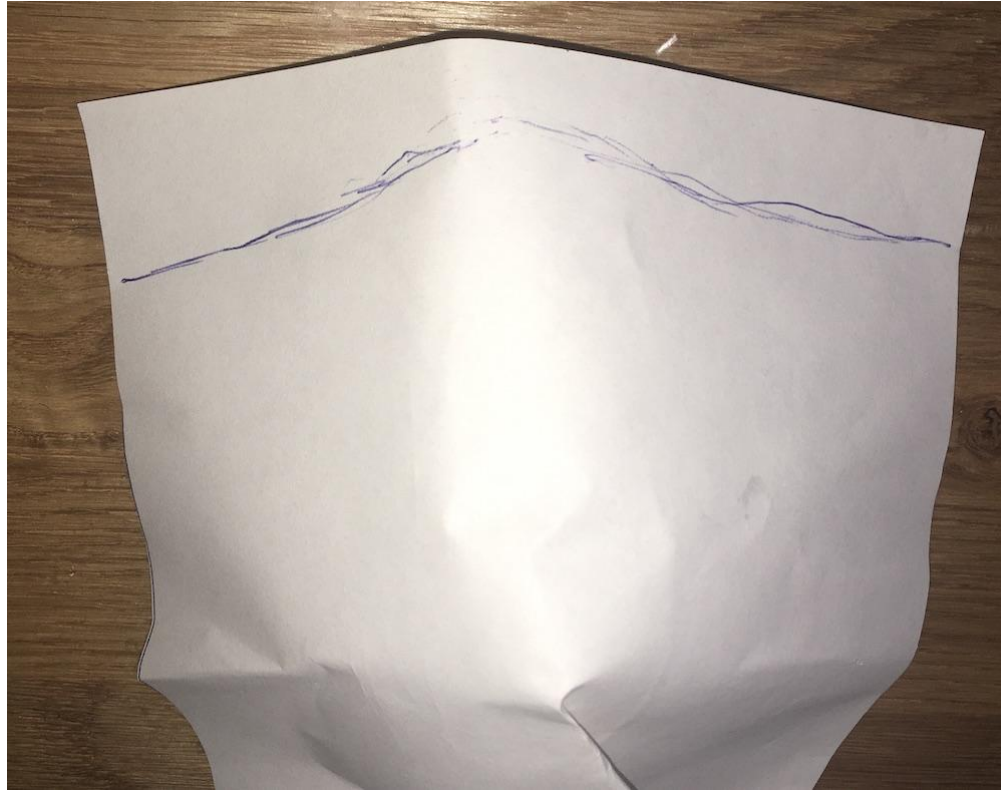
Note the scrunched up bottom piece that was necessary to make the outer mask fit well before marking the paper, but we are not marking or cutting the bottom of this template for the would-be liner yet.

Flattened out, now cut the top line as best you can.
Even it out if needed (should be a left to right mirror):
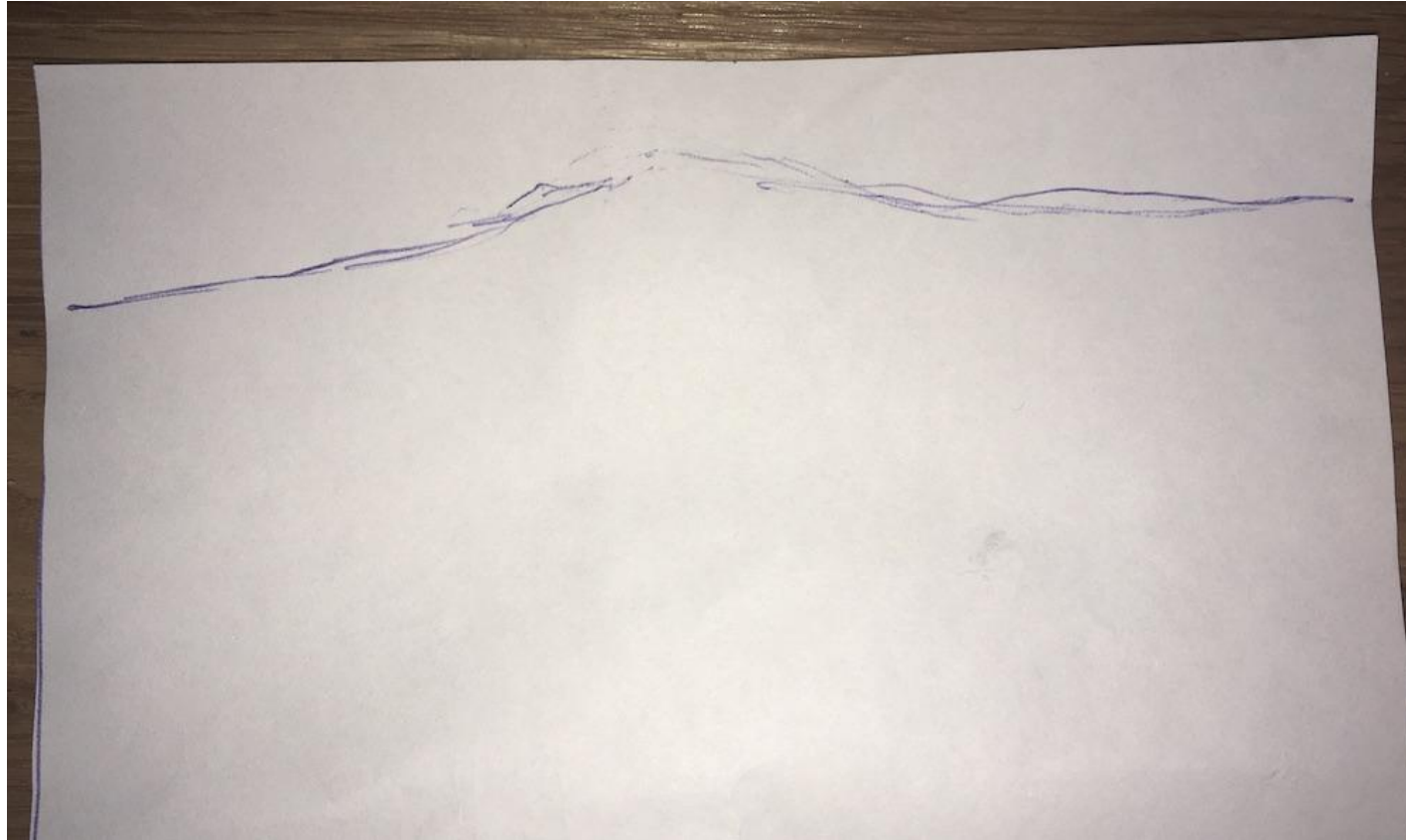
Here I've placed the paper template on a larger piece of satin. We are only going to mark then cut the left, top and right edges. Thus, it is deliberately long (top to bottom) as that cut will come much later in this process:
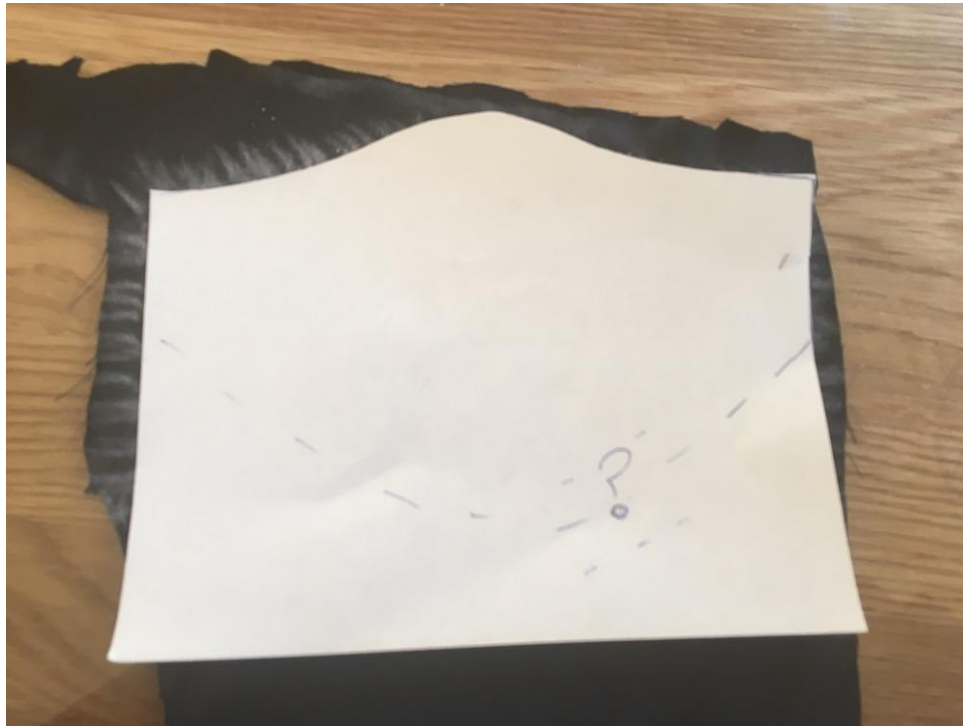
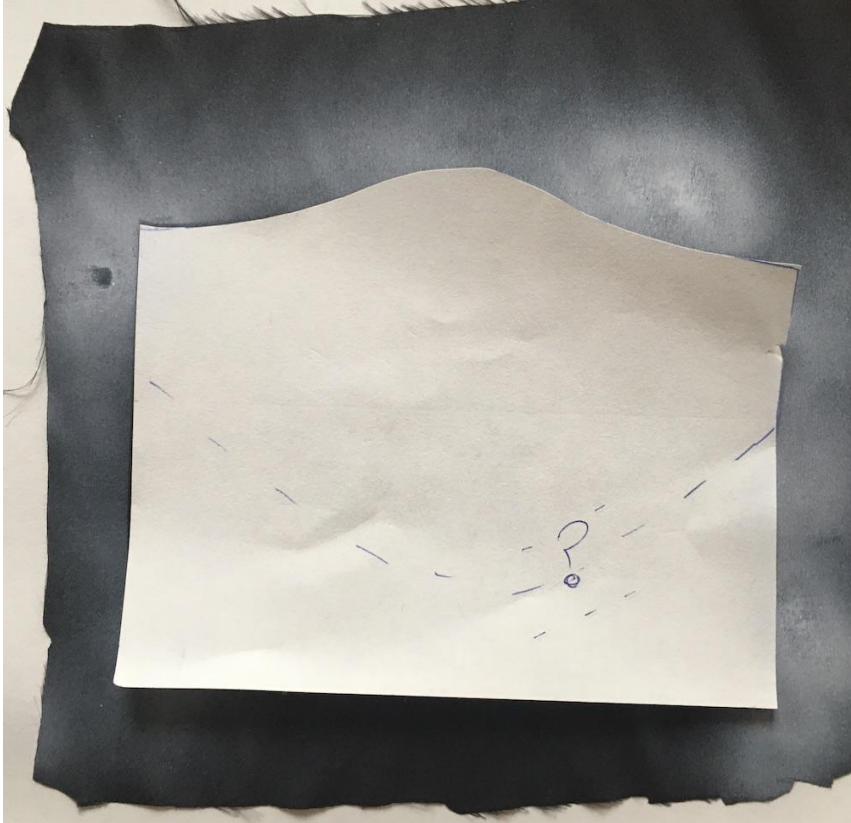White tailor's chalk was used to mark top, left & right edges

With the paper removed, white chalk marks more visible. Our intention is to make a liner with a single layer of satin:
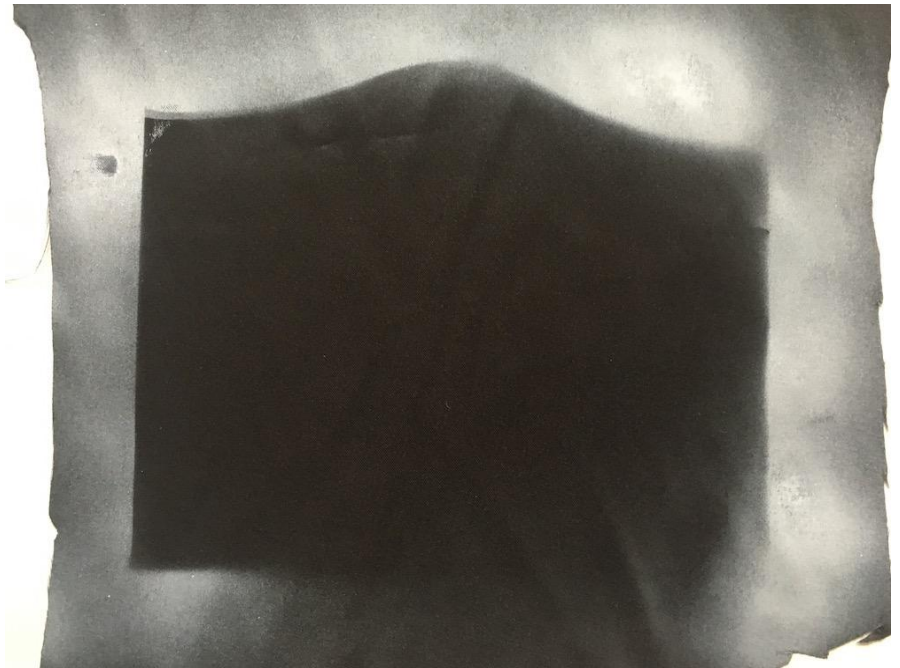
Now cut to that chalk mark line:

Instead of chalk you could try spray paint, but it is messy. Make sure to hold down the paper as you spray the edges:

Paper template, sprayed

Paper template removed
ahead of scissor work

Affix velcro dots to top edge of satin liner

Make a pocket for the plastic guard on the left and right of the mask. My cheap sewing machine struggled to get through this thickness of fabric.

Stick velcro dots too.

Wearing the mask part complete and facing a mirror, ensure that the liner is pulled down neatly into position. You can see that the liner is clearly too long:

In this pic, the reason for the mirror is clearer - I have chalked the satin liner at the point where it sticks out under the outer mask:

Smooth out that curve when the liner is flat on a table and cut the excess off.

Plastic guard type

This version uses a craft knife (or bigger) and there's a real danger you'll cut yourself. As you don't want to visit hospital for emergency care ('cos they're kinda busy right now), wear thick leather gloves and do the cutting work very very carefully (on a piece of wood that's not too important).

Plastic guard - start with a £1.50 ($2) placemat from your supermarket:

Cut a shape from the placemat. Width should be as wide as the outer mask when it is stretched slightly:

Put the liner in the outer, connecting the velcro dots:

Put the plastic guard in the two pockets and do whatever fiddling is needed to make it all smooth and centered

Copper wire guard type

The wire is 3mm diameter copper, and some work with pliers is needed. Perhaps also a metal file to smooth down the ends that you've cut through.

Fashion the wire guard to go in the two pockets. Not too long or you will not be able to stretch the outer mask to go over the wire ends.

Sharp ends should be bent over with pliers to protect the wearer's skin when in use

All put together and ready to wear. This one is less fiddly

Thread ends for the two pockets need to be tied off:

The edges of the satin liner can be sealed to prevent fraying in a candle flame. Just in case: do this outside so you don't accidentally burn your home down:

Comparison

The wire version is slightly more breathable, but you can feel the metal against your cheeks, and the fabric pulls slightly towards your nostrils/lips as you breathe in.

The plastic version keeps the satin more stationary as you breathe in (better cupping), but has effecively reduced the surface area of the fabric meaning is it slightly harder to full your lungs.

Notes

1. The same mask with satin and **no copper/plastic guard** is actually harder to breathe through. The cupping action of the wire does increase the surface area to draw breath through, by holding the fabric away from your nostrils/lips as designed. The copper wire is flexible so that it can be bent in-situ for the best cupping action in front of the wearer's face. The plastic guard less so. Cupping should only be used when the mechanism isn't pushing the sides of the mask away the wearers face which would let unfiltered air in and out.
    a. A version of this mask with the satin liner but without a copper/plastic guard was worn on a London trip where I was likely exposed to COVID-19 (March 2-4) and had to self-isolate at home for a week (I was notified a week after the end of the conference).
2. I don't actually know the air permeability or porosity figures for satin and whether it is good enough for virons that are 125 nanometer in diameter that are inside water droplets from exhaled breath (etc). I wish that https://smartairfilters.com/en/blog/best-materials-make-diy-face-mask-virus/ also listed satin for comparison to other fabrics. The design in this guide could be used for other fabric liner choices, too.

Future Modifications & Experiments

1. Hand sewing the velcro dots after sticking them is probably needed, as washing the liners can weaken the glue, and dots fall off. Replacing the velcro dots' own glue with "flexible super glue" didn't work. Machine sewing the dots in place was a horrible "bunching" mess. At least it was with my $20 Amazon sewing machine.
2. A copper wire version that zig-zags up and down … as it extends left to right.
3. A plastic guard that has one or more "stays" in the middle (I messed this one up):

4. A two-layer satin liner might be worth trying … if that is <u>not</u> impossible to breathe through.
5. This design could be used for liner fabrics choices other than satin. I'll update this section as reports come in.