



# FOAMSMITH 3

HOW TO MAKE HELMETS, CROWNS, AND MASKS

BILL DORAN

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**Foamsmith 3: How to Make Helmets, Crowns, and Masks**

by Bill Doran

Find Bill on the web at [PunishedProps.com](http://PunishedProps.com)

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Photography by Bill Doran

Editor and Layout by Brittany Doran

Illustrations by Paige Cambern

# ACKNOWLEDGMENTS

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It has been over three years since I wrote the last Foamsmith book; “Foamsmith 2: How to Forge Foam Weapons”. In that time the craft of manipulating EVA foam into intricate pieces of costume armor and prop weapons has exploded. Makers around the world have pushed our art to an other worldly level. We’ve challenged one another to do better and push ourselves, but we’ve also shared what we know with one another, elevating the entire community.

We are entering the golden age of foamsmithing. Thanks to the efforts of some of the most driven members of our community, we now have access to materials that are custom made for our craft. EVA foam has never been available to us in such variety and utility. Add that to the massive pooling of technical knowledge and you get some of the most mind-blowing work the cosplay scene has ever witnessed.



Evil Ted Smith  
[eviltedsmith.com](http://eviltedsmith.com)



Nick Kettman  
[modulusprops.com](http://modulusprops.com)



Steven K Smith  
[sksprops.com](http://sksprops.com)



Sophy Wong  
[sophywong.com](http://sophywong.com)

I've learned volumes over the past three years. I'll be sharing everything new I've learned in this book, but it's important for me that you know I couldn't have made it this far without bucket loads of inspiration and help from a handful of dedicated, wonderful foamsmiths. A huge thanks goes out to my friends Harrison Krix, Nick Kettman, Steven K Smith, Benni & Svetlana, Evil Ted Smith, and Nic & Tabitha.



**Punished Props Academy Team at Dragon Con 2018  
Paige, Bill, Brittany and Everett**

You all help me be a better foamsmith and, more importantly, a better human. Thank you. =)

The most special of thanks goes to my incredible wife and partner, Brittany. Your love, kindness, support, and most importantly, patience, has made all of this possible. Thank you. I love you so much.

# ABOUT THE AUTHOR

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Hey there fellow maker, I'm Bill Doran, author of this here Foamsmith series! This year marks my... \*checks notes\*... tenth anniversary as a cosplayer?! My friends and I got started in the craft by dressing up as the blue team from Team Fortress 2 at the PAX West event in 2009. After that, everything was different. All I wanted to do was work on the next costume or the next prop. My hobby quickly took over every spare minute of my life until I decided to throw caution to the wind and in 2012, quit my day job in corporate America to start making props and costumes full time.



Since then I've made dozens of costumes and hundreds of props. Many of those pieces were made for clients worldwide. Along with creating my prop and costume replicas, I also started sharing what I knew through internet videos. To date, we have produced well over 650 instructional videos and reached hundreds of thousands of new cosplayers all around the globe.

Nowadays, I spend my time building props and running Punished Props Academy along with my wonderful wife Brittany in our workshop in Seattle, WA. We're quickly growing our team so that we can more effectively teach passionate fans the skills they need to make the astonishing costumes and props that they're obsessed over.

# THE FOAMSMITH SERIES

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Welcome to *Foamsmith 3: How to Make Helmets, Crowns, and Masks*

What began as a handful of eBooks filled with my tips and tricks on making foam costumes has evolved into an institution. Foamsmithing is a *thing* now. We've picked up so much steam that there are now several companies producing specialty EVA foam just for cosplayers! I've personally seen so many mind-blowing examples of foam costume and prop work that I can hardly believe it. Events like Dragon Con, BlizzCon, SDCC, and the myriad of other costume events around the world are now awash with astonishing foam costumes that defy what's possible in our craft.

The first book in this series was designed to help beginners get started down the foam path with their costumes and props. We tackled some increasingly difficult projects in the second book, covering some rather intricate props. This third installment is going to push your skills to the limit as we deal with one of the most perplexing forms on the planet; the human head.

I have made many foam headpieces and collected a wealth of tips, tricks, and techniques in this book that will make the process quicker and easier for you. With enough practice, what you learn will also upgrade your skills beyond what you thought was possible. It's time to level up, dear Foamsmith! Let's get to work.



## What You Should Know So Far

The methods in this book are designed to produce incredible results, but they will challenge you. The first two books in this series contain everything you need to know to get up to speed. If you've already dipped your toe into the foamsmithing pond, you should be armed with the knowledge to start making helmets with confidence, but if you're an absolute beginner, I would recommend starting with a more basic hand prop project, like a dagger. If you'd like some ideas and free patterns for beginner projects, we have a "new maker" page on our website at [punishedprops.com](http://punishedprops.com).



## What's covered in this book?

Most of this book is only going to cover headgear patterning and fabrication. Foamsmith 1 & 2 covered the lighting, painting, and finishing techniques I'll use in this book, so I won't cover that ground again in too much detail. That being said, I will cover a handful of more advanced finishing techniques on my example projects later on in the book. These are intermediate to advanced level techniques that will help push the look and feel of your helmets to professional levels.

The first part of the book will cover some new materials and tools, as well as creating from-scratch patterns and fabrication techniques for a variety of helmet, mask, and crown styles. The second part of the book is a collection of example projects, each focusing on a different set of techniques to achieve a specific type of look.

# CONTENTS

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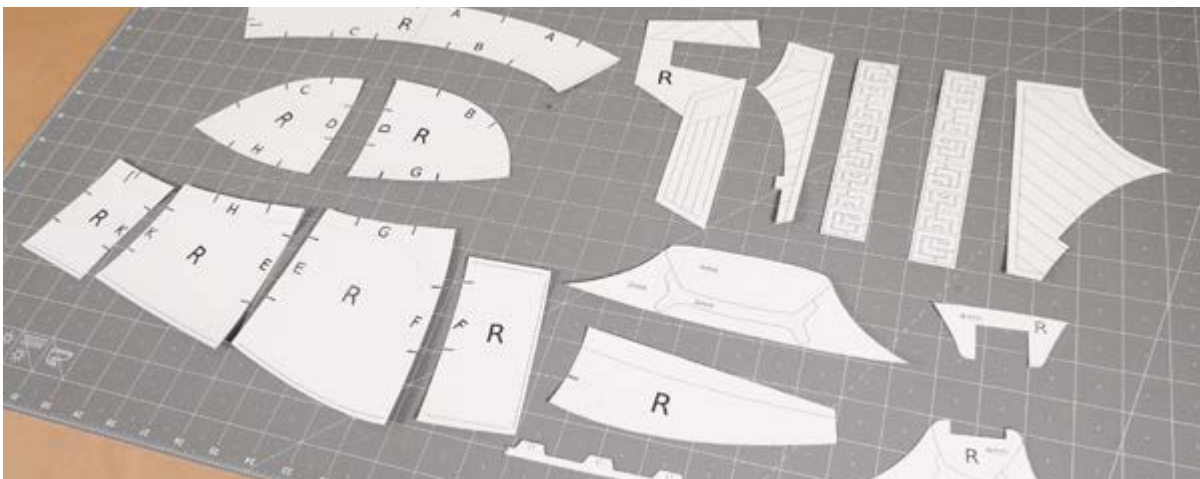
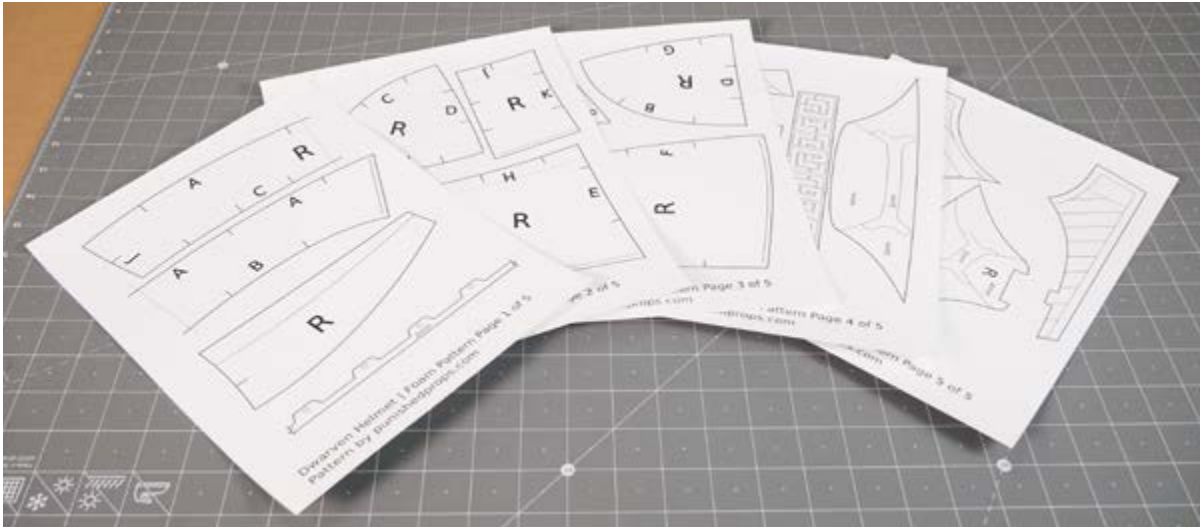
Part 1: Creating Headgear	
Provided Templates .....	9
Safety First!.....	11
Starting Thoughts.....	12
New Tools & Materials.....	13
Design Considerations .....	17
Using Premade Patterns.....	23
Making Foam Helmet Patterns Completely From Scratch.....	26
Cutting and Assembling.....	42
Pre-form Your Parts .....	45
Gluing Your Seams.....	46
Adding Details to Your Head Gear .....	51
Foam Clay Sculpting.....	63
Adding Texture.....	71
Fitting, Vision, and Comfort.....	73
Accessorize! .....	80
Visors .....	97
 Part 2: Crown	
Basic Crown Build .....	109
Painting the Crown .....	124
 Part 3: Helmet	
Dwarven Helmet Build .....	130
Painting the Dwarven Helmet.....	152
 Part 4: Mask	
Organic Mask Build .....	158
Painting the Mask .....	174
Wrapping Things Up.....	187

# PROVIDED TEMPLATES

Later on in this book I will showcase several helmet projects from start to finish. I've designed the projects so that you can build along with me! To help you get started, I created free template files that you can download and print out yourself at home.

Get your free digital files here:  
[www.punishedprops.com/foamsmith3](http://www.punishedprops.com/foamsmith3)

The files are a PDF format and can be printed on any letter sized printer. For more durable printouts, I recommend printing on a heavy card stock. I've also included SVG vector files so that you can cut out your parts on a laser cutter.



# Part 1

## Creating Headgear



# SAFETY FIRST!

I get it, we both want to dive into a pile of foam, heat gun blazing, and just start slamming out a helmet, but first we need to be honest with ourselves about safety. While foamsmithing isn't the most dangerous hobby, it isn't without some inherent risks. It's critical that you acknowledge any potential danger to your health and well-being and take responsibility for your own safety. The most important thing you can do to stay safe is to stay present. Keep your mind focused on the task at hand; not what you'll be working on next. This is especially important when working with power tools.



Speaking of power tools, if they came with a safety manual, read it. That goes for any materials or chemicals you're working with. They should all have safety data sheets that will let you know what you're working with and what kind of precautions you need to take to stay safe.



As a foamsmith your main concerns are going to be dust, sharp tools, hot tools, and harmful vapors. It's always recommended that you wear the appropriate respirator and work in a well ventilated area or outside whenever spray painting or using toxic glues. Any time you're sanding foam and creating that nasty dust you'll want to wear a dust mask. For sharp or hot tools, working in a clutter free space with designated safe areas for anything that can hurt you, like a heat gun, will help prevent any unnecessary accidents.



*Most importantly, be patient. Haste is the most common cause of accidents in the shop. Take your time and keep yourself out of harm's way.*

# STARTING THOUGHTS

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Making helmets is difficult. I won't sugar coat it. Human heads are weird, complex forms with a plethora of many annoying requirements. We need to see, eat, drink, breathe, and hear? Inconvenient! Those needs can be a difficult engineering challenge when you're planning to wrap your melon in EVA foam and also try very hard to make it look like a perfect recreation of your favorite fictional headpiece.

It isn't easy, by a long stretch, but I'm going to let you in on a secret: Every foam helmet I've ever built has been rebuilt and patterned at least twice, sometimes three times. Prototyping a helmet is exactly that; iterating on a design until it's exactly what you need and then building a fresh version with everything you learned in the early versions. I don't always need to do this for foam armor or props, but I always do it when I'm building a new helmet.

At some point you will get frustrated. You might accidentally make the left side of the helmet twice instead of making a left and a right side (I've done this more times than I care to admit). You'll make something way too small to fit on your head. You'll make something way too big. I've done that on past projects, and I'm sure I'll do it again. This is all OK. It's all a part of the prototyping process. If it was easy it wouldn't be nearly as satisfying when you finish the helmet and it's everything you dreamed it would be.



# NEW TOOLS & MATERIALS

In the three years since I wrote Foamsmith 2, we have been spoiled with new offerings of EVA foam products at our disposal! I'd like to take a little bit of time to go over some of the latest and greatest materials in the foamsmith arsenal.

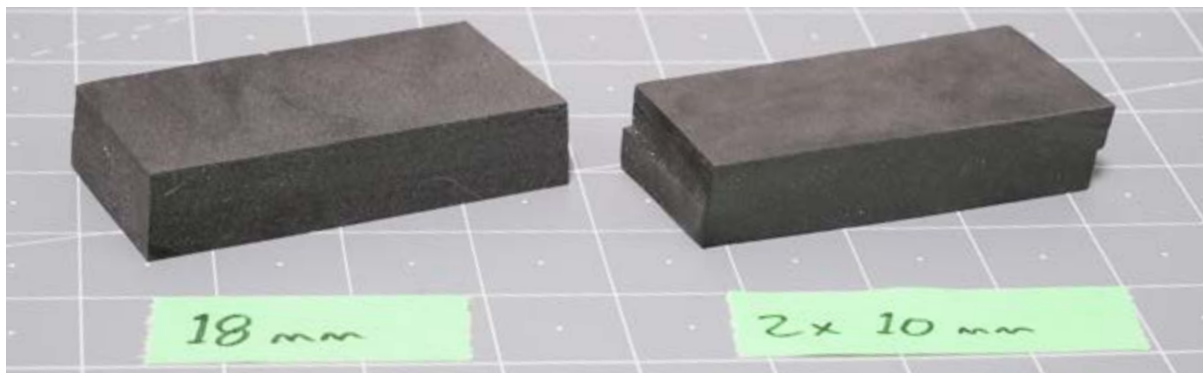
## EVA Foam Sheets

The days of using your belt sander to remove the checkered pattern from one side of your Harbor Freight floor mats are over! Don't get me wrong, you can still make an exceptional helmet from cheap floor mats (I still use them for my early prototype pieces), but we now have access to large sheets of foam. These are available in a variety of colors, densities, and thicknesses.



Larger sheets means we no longer have to stick two floor mats together, edge-to-edge, if we're making something longer than two feet. These sheets are completely without texture, which makes laminating them together in layers much easier and the variety of thicknesses means we have a lot of room to experiment.

I tend to keep a well stocked foam shelf with mostly 10mm thick foam for the base forms for armor and helmets. 8mm and 6mm are also sturdy enough to use for a helmet if you need something that looks a little thinner. For details I always have lots of 2mm foam and 4mm or 6mm sheets to give me lots of options. You can also get your hands on sheets that are 20mm thick or more! This saves loads of time if you're making something fairly thick and don't want to spend the time to laminate several sheets together.



How much of this glorious foam should you buy? For any given project I try my best to estimate how much I'll need and then I buy 2-3 times more than that. This covers me in case I estimated too low and it also covers me when I inevitably goof up a cut and waste a large piece of foam. Having leftover foam at the end of a project is a good problem to have. Running out of foam when the project needs to be done today, is a bad problem to have.

## Foam Dowels

These are an absolute luxury and I love them so much. Foam dowels are your standard EVA foam that has been cut into thin strips in a variety of sizes and shapes. The applications for these are absolutely endless.



One of the many things these strips of foam are good for is trim. Their flexibility means they can be wrapped around complex forms to add that nice bit of raised detail to any helmet.



The list of things you can make using foam dowels is infinite. We've used them to simulate tubes or wires, antennae, and bolts.





**“I try my best to estimate how much foam I’ll need and then I buy 2-3 times more than that.”**

## Foam Clay

Sculptors rejoice! There is now a foam product available for free form, hand sculpting your prop and costume creations. While this stuff isn't technically EVA foam, it is a safe, non-toxic material with an unlimited amount of potential.

This "clay" can be sculpted directly onto another piece of EVA foam, which makes it perfect for adding sculpted, organic detail to any of your foam prop or costume pieces. It does take quite a long time to dry (1-2 days), depending on how thick of a layer you've used, so drying time must be considered if you're under a time crunch to get your project finished.

One of the most impressive things you can do with foam clay is cast forms out of press molds. You can press foam clay into a silicone mold to make castings of intricate designs that, once fully dried, can be glued down to your helmet. I'll dive into this process in greater detail later in the book.

## Neoprene

More often than not we end up sealing our foam creations before painting. This is done to create a smooth, even surface for the paint job. There are several materials used for sealing foam that we've covered in past *Foamsmith* books, but recently I've become rather fond of sealing my foam with neoprene. It's an air drying rubber, similar to latex, but without the chance of a latex allergy. It also comes in several levels of rigidity and the more rigid versions can even be sanded (latex cannot). I like how easy it is to apply with a brush or a siphon spray gun. Once the neoprene is fully dry it can be painted directly with acrylic paints, which gives it a huge leg up over latex.



Along with these new materials, every day there are new techniques and tools invented by cosplayers who are always trying to push what's possible with these humble foam materials. If you're reading this book 10 years from now then I'm already jealous of whatever amazing materials and tools you have available to you in 2030.

# DESIGN CONSIDERATIONS

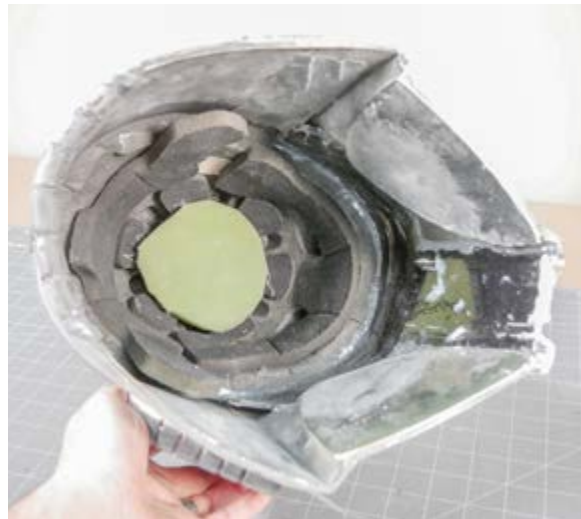
Before we dive straight in and start cutting up some foam, there are some design considerations we'll want to address. The first being travel. Will you ever need to make this helmet fit into your luggage? All of my costumes need to be able to fly around with me and many of them have helmets with features that are just plain too big to fit in any standard sized luggage. Those features are usually horns.



My Destiny and Skyrim helmets are perfect examples. I knew that these were going to fly with me to Dragon Con, so I designed the horns to be removable right from the start. For futuristic Shaxx I made a simple friction fit mortise and tenon slot that worked perfectly by combining an EVA foam slot and a rigid, plastic tab. For the undead Draugrs we got all fancy and used metal nuts and bolts to attach the horns.



Something else to consider is whether or not you can use a found object as a basic form to start your build. A common example would be to buy a premade helmet or mask and simply add foam to it to modify the helmet to look like whatever you're trying to replicate.



Another great example is see-through, plastic visors. If you're a wiz with a vacuum former and you can make your own custom visors, that's awesome. If not, then there's a lot you can accomplish with store-bought visors. If you find a motorcycle visor or a costume chrome "no face" visor that's close enough to the design you're replicating then that visor can be the form that you design the rest of the helmet around.

Depending on the form of your helmet, you might even design it around an adjustable hard hat suspension system. If your helmet is large and unwieldy, something like this can make wearing the helmet much more stable and comfortable.



One of the other considerations I spend a lot of time figuring out is the placement of my seams. When you're trying to alter a flat material like a sheet of EVA foam into a complex curve like a head, you're going to have to add some seams and darts. One of the reasons why I end up prototyping a helmet more than once is I usually have to alter the position of the seams so that they will either be hidden by additional layers or at least be in a place where they will be less noticeable.



Another important consideration is lights and electronics. For LEDs you'll want to figure out where they need to be placed, where you can run your wires, and where you can hide your batteries as early into the build as you can.



The same goes if you're going to add smoke effects to your helmet. You heard me right! There are now fog machines so tiny that you can sneak them into your props and costumes! For a helmet, you'll want to figure out if you're going to run any tubes for the smoke as well as the wires, switches, and batteries.

If you're planning on having any moving parts on your head gear, plan to take quite a bit of time prototyping the mechanism. This is another reason why I usually end up prototyping a helmet 2-3 times. Whenever two parts of a helmet need to move and interact with one another, there are several factors (pivot points, friction, foam thickness, etc) that can have a huge impact on the success of that movement.



Something else to consider before you start building is weight. One huge benefit to using EVA foam over some other material is how light the foam is. Most of my foam helmets weigh less than a pound, which is great news for my neck. If you're wearing a heavy helmet on your head at a convention all day long, you're going to feel that strain in your neck for the duration. This is especially true if your headgear has any protrusions that extend far from your head, like large horns (I'm looking at you, King Loki). That leverage creates extra strain on your neck, back, and shoulders that, if left unchecked, can be extremely uncomfortable or even injure you. If you're planning on adding anything large or heavy to your helmet, put some extra time into engineering a solution that won't damage your human body.



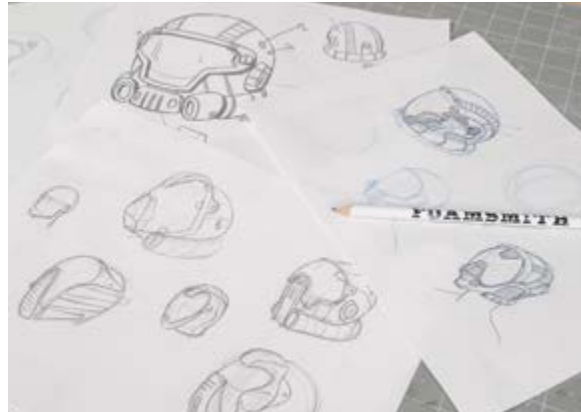
**0.93 POUNDS (422 GRAMS)**



**0.58 POUNDS (263 GRAMS)**

Speaking of our organic meat carcasses being fragile, there's also a chance of overheating in your headgear. Air doesn't travel through EVA foam, so any foam that keeps contact with your skin can become a sweaty mess. The more foam that can be suspended away from your skin, the better. Even snug fitting helmets should have a small air gap all the way around your noggin. Then, the helmet can be suspended in place with small pieces of foam, which we'll get into later.

All of these considerations should be as well thought out as possible before you start building. Collecting as many reference images of the piece you're replicating as possible will make your job much easier. Also, making as many design drawings as possible at this stage can help you visualize the entire build before you've had a chance to ruin any foam. Just make sure you take plenty of notes along the way. Future you will thank you.



This is your first prototype, take your time with it and ask for help when necessary. Odds are good that someone on the internet has solved a similar problem already and would be more than happy to share their methods.

### 3D Printing

It's currently 2020 and the prop and cosplay scene has almost completely embraced 3D printing as a standard method for total fabrication or at least for augmenting more traditional methods. For foamsmithing I use 3D printing all the time, especially when I need to add something that's either meant to be extremely precise or highly detailed to my foam build.



This is especially handy for custom made parts that would be far too flimsy if they were made out of only foam. My Mechanist antennas were 3D printed out of ABS plastic. They even unscrew from the helmet to keep them from breaking during travel.



**3D PRINTED ANTENNA**

Those are the main concerns you should ponder before you begin your build. Now I'd like to share with you what's possible. These are all EVA foam helmets and masks that my wife and I have made over the years. The possibilities are endless. If you'd like to learn more about the construction of any of these examples, most of them have tutorial videos available on our website ([www.punishedprops.com/foamsmith3](http://www.punishedprops.com/foamsmith3)).



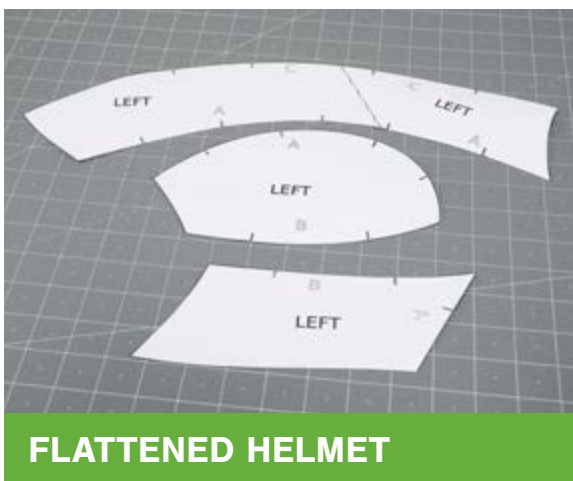
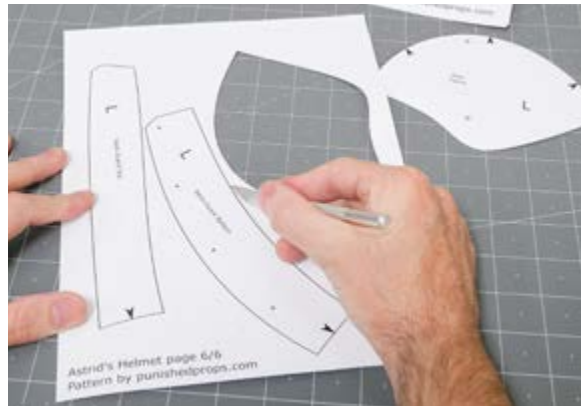
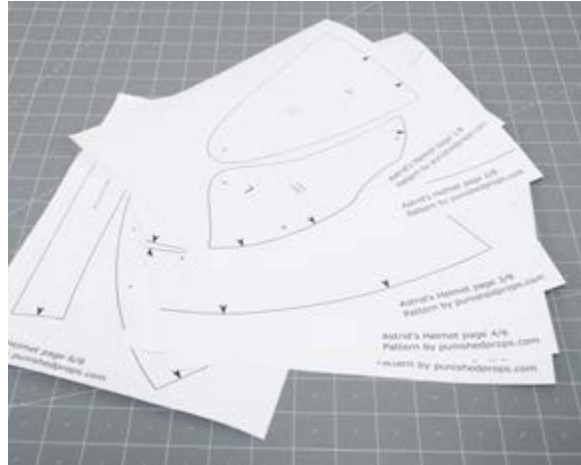
Alright, now that we've covered everything you need to know before you get started, we're ready to dive into construction. Get those tools out, it's time to begin.

# USING PREMADE PATTERNS

To make a three dimensional helmet out of two dimensional sheets of EVA foam, you're going to need a set of patterns so that you know what shape all the pieces need to be before assembly. You can either make those patterns from scratch or use a premade pattern.

Most of the time, when I'm making a helmet from my favorite video game, I usually pick something that hasn't been made by anyone else yet, or at least something that very few people have made. There's something about the challenge of starting from absolute scratch that I find extremely appealing. We'll go over that in great detail in the next chapter.

Sometimes you'll get lucky and the thing you want to make has not only been made by someone else, but that person was kind enough to share the patterns they made so that others can skip the patterning stage and jump straight into fabrication. I have several of these patterns available for download on my website as well as the example projects in this book. They are usually digital files that are meant to be printed with your home paper printer.

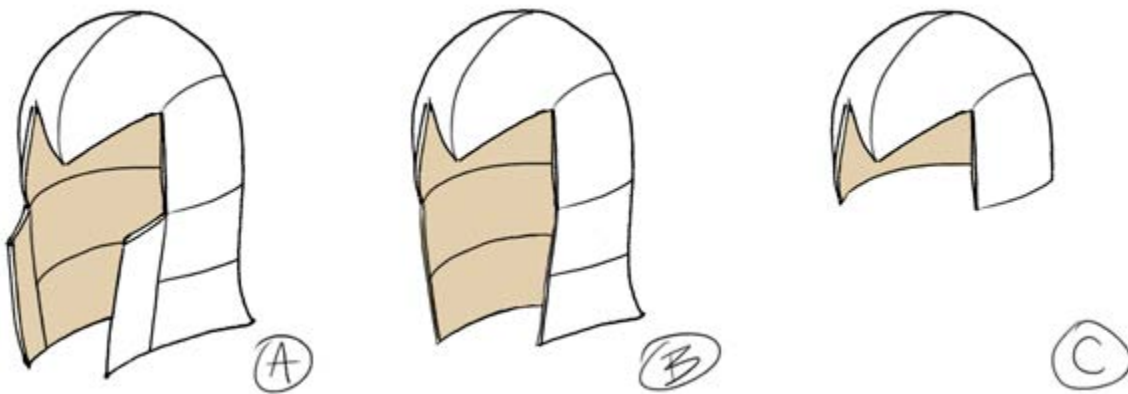


Starting with a premade pattern is a great way to get comfortable with the type of foam fabrication necessary to make a helmet. The challenge, of course, is finding these pattern files for download. As far as I know, there isn't a single repository for foam patterns and templates, so your quest may be challenging. Recently I've seen patterns shared on [therpf.com](http://therpf.com), in various costuming Facebook groups, and for sale on websites like Etsy. You may have to poke around a bit, but if you're trying to build something fairly popular, like Iron Man, you can probably find what you need.

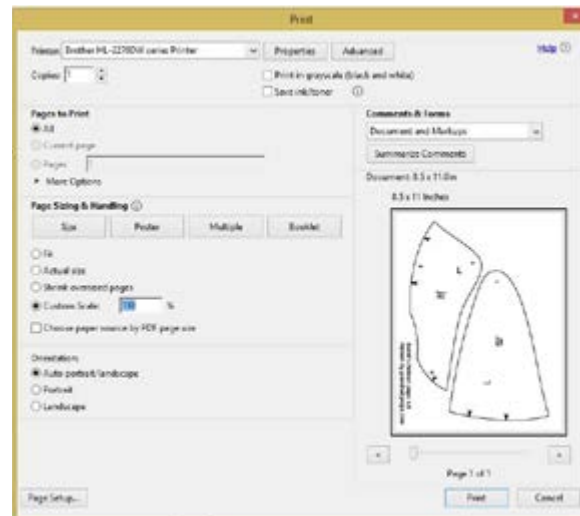
Please remember that whoever has made these patterns has spent a lot of time doing so. They might not want to share or sell their patterns at all and that's totally up to them. They also might sell their patterns so that they can make a little money back from the work they put into developing those patterns. Most of the examples of foam patterns that I've seen for sale are pretty great and priced competitively. Paying a few bucks for a print-at-home pattern is a fair price for getting to skip that entire part of the build, while saving some prototype foam in the process.

Several makers, myself included, sell cheap, basic helmet patterns. These are meant to be used as rough, head shaped forms that can be modified to make it look like a wide range of other costume helmets. If a basic pattern like this is close enough to the design you're trying to replicate, then you can shave a day or two off your helmet build. Well worth the cost of admission.

If you get your hands on a foam pattern for a helmet that's similar to the helmet you're trying to replicate, it might be quicker to start with that helmet as a basis for your build and modify it where necessary. Just like a basic helmet pattern, this can shave days off your helmet build.

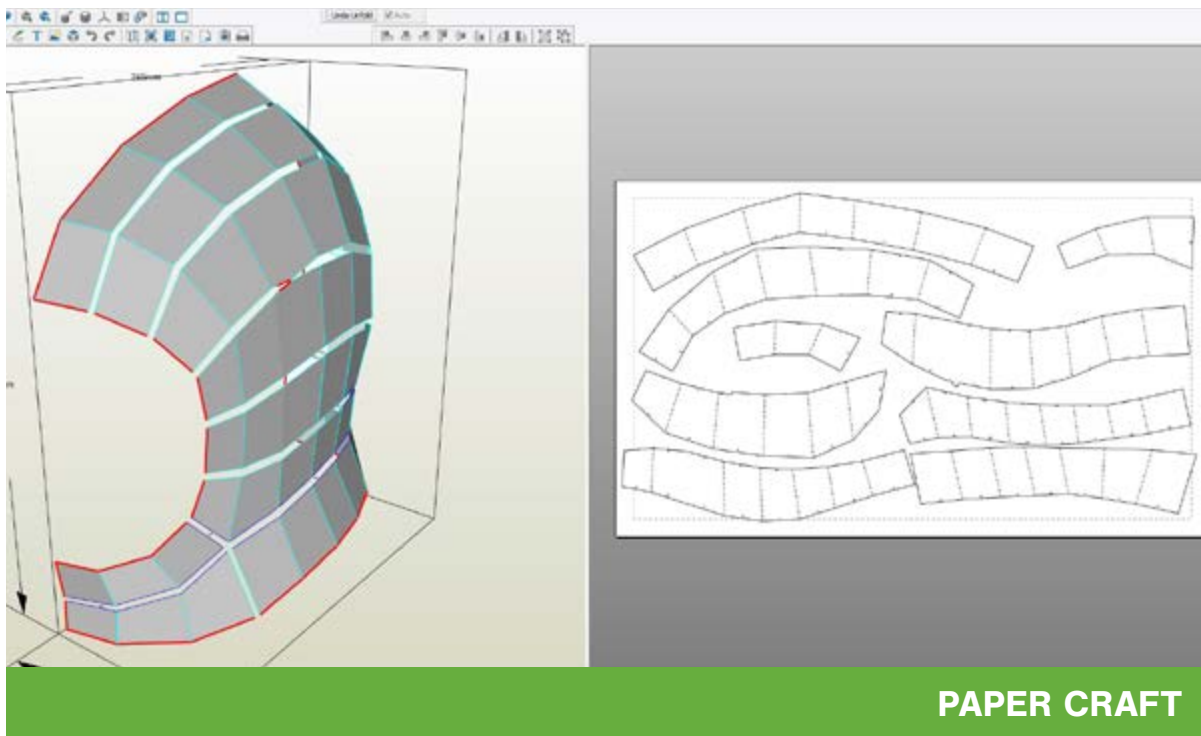


One of the only real challenges with using a premade helmet pattern is the sizing. Odds are good the original creator built the helmet to fit on their own head and you may have a differently sized head. This is why I recommend building a basic prototype helmet from your purchased pattern using cheap floor mats to make sure the helmet fits properly on your head before dedicating days of detail work to the project. If the helmet is too large you can reprint the patterns at a smaller scale or vice versa if you need it to be larger.



## Pepakura

Another great place to find patterns for foam builds is the pepakura community. Pepakura Designer is a computer application that transforms 3D models into 2D patterns for paper craft. There are several websites and Facebook groups that are pepakura file repositories and again, loads of that kind of thing shared on therpf.com. If you're super lucky, you'll find a pepakura pattern that someone has expertly modified for foam. If not then you'll have to do it yourself. I recommend scouring the internet for tutorials on using Pepakura to your full advantage if this method seems appealing to you.



# MAKING FOAM HELMET PATTERNS COMPLETELY FROM SCRATCH

Creating a totally custom foam helmet pattern completely from scratch is no small feat. Patience and perseverance will be required, but if you get this process locked down, there won't be a helmet in the 'verse that you can't replicate. Just know that there are many parts of this process that require a certain "knack" that you'll pick up the more you do it.

If you're planning to pattern a helmet, you're going to need some kind of human head form as a foundation. You could technically try and pull a pattern off your own head, but working on a head that's in front of you and not attached to your own shoulders is much more convenient and safe. The very best way to get a head form that's accurate to your own head is to get a life cast.

The idea is that you get some friends to help make a mold of your entire head using either alginate or silicone plus a rigid outer mold made from plaster. Once that mold is done you can pour a copy of your head using something like hydrocal plaster or urethane foam.



If you ask around your local communities, especially anyone into special effects or stage production, you might be able to find someone you can hire to make a copy of your head. If not, it's a great project that you can knock out with a couple friends in an afternoon. There are dozens of great life casting tutorials on YouTube, but if you really want a deep dive into the subject, my friend and special effects wizard, Steve Winsett, wrote an amazing eBook on the process using alginate (ebook available at [punishedprops.com](http://punishedprops.com)).

*Life Casting the Human Head - A Comprehensive Guide to Creating Your Own Life Cast* by Steve Winsett



Life Casting: the Human Head - By Steve Winsett - eBook

\$5.00

Have you ever wanted to have your own life cast? In this book, I cover the basic human head life cast. I go over everything from materials, to bald caps, to applications, to casting in stone. It's over 80 pages of step by step methods to producing a life cast.

[Buy Now](#)

This is how my life cast was made. Although, technically it's a life cast of my identical twin brother Rob, but it gets the job done!



Alternatively, you can buy an already made head cast that is similar in size to your own head. Cheap, party store style, styrofoam heads can work for some applications, but they tend to run a little small. Some special effects companies sell their own busts designed for sculpting and patterning. These high quality, plastic heads are extremely durable and if you've got the money for it, they'll be an extremely useful tool for years.



Another option is to make a head using, you guessed it, EVA foam! I have a pattern for a human head in a variety of sizes available on my website that's designed to work for a range of head dimensions. It's a little extra work, but it's a cost effective way to make a properly sized head form and if you already have some foam scraps and glue lying around, you could make one today!



Once you have your head form squared away then you're ready to start making your pattern. You're just going to need a handful of tools.

### Additional Tools

- Aluminum Foil
- Hot Glue Gun
- Duct Tape or Masking Tape
- Ruled Cutting Mat
- Hobby Knife and/or Scissors
- Pattern Notcher (optional)
- Vector Drawing Software & printer (optional)

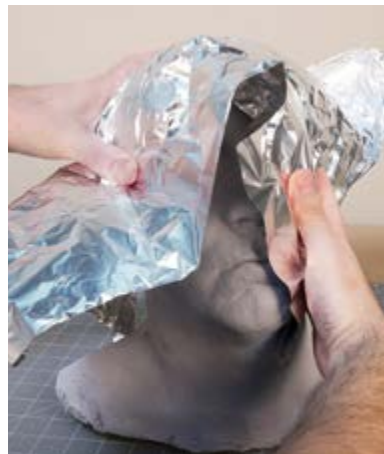


### Prepping Your Head

If the helmet you're going to build is mostly snug with the human head, you can get started with the pattern right away. If your helmet or mask is not shaped like a human head, then you're going to have to bulk up your head form first.



This is where things get a little bit arts and crafts. To protect your head form, start by wrapping the entire thing in aluminum foil or plastic wrap. The goal is to create a barrier between your head form and the rest of the mass we're going to add.



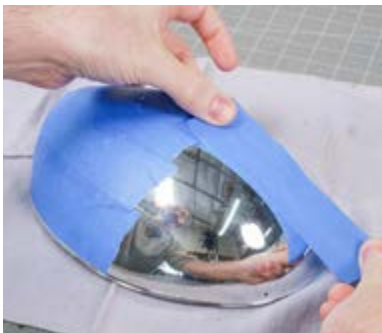


*Once the head is wrapped in foil, cover it in strips of tape.*



At this point, if your helmet design is skin tight, you can start laying out your pattern, but since we're working on a bulky helmet, we need to add some mass. If you have any pre-made parts like an existing helmet or a visor, those should be attached to your head form at this time. They don't have to be attached permanently, some masking tape should be enough to hold these pieces in place while you sculpt the rest of the helmet form around them.

*If you're worried about scratching a premade visor while working with it, cover it entirely with masking tape for protection.*



Technically now we're going to sculpt. That's where your aluminum foil and a hot glue gun come into play. Start by loosely balling up sheets of foil to create wads of material and then hot glue those wads to the duct tape barrier on your head. At first, just focus on creating more mass where you need it. Try to hold off on compressing the foil until later when you're refining your forms.



Remember that your focus here should be on creating only the basic three dimensional forms of your helmet. Details, holes, fins, spikes, or trenches can be figured out later once you've nailed the pattern for the base form. Most of this foil work can be done by hand, but some basic sculpting tools, like a tongue depressor, can be handy for creating hard edges and creases, if necessary.



*If your helmet is symmetrical, you only really need to sculpt half of it!*

**FOIL SCULPTING**

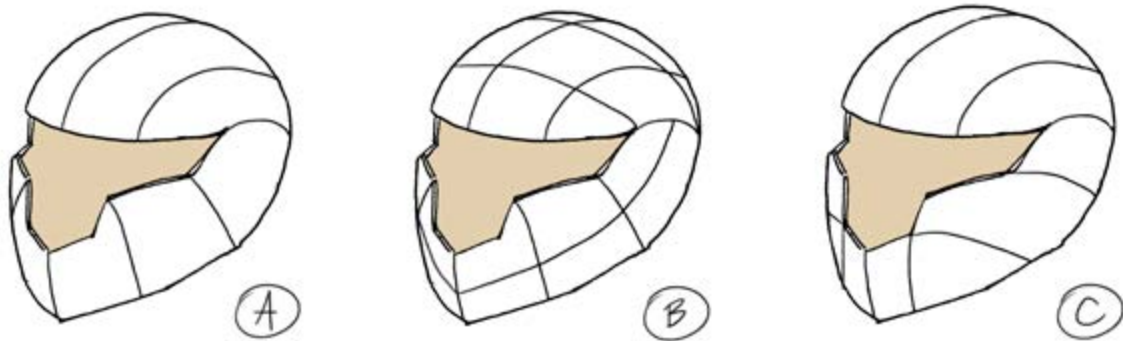
This is definitely a part of the build that's worth spending some extra time to make sure you get it right. Be sure to look at your sculpt from every angle, even upside down, to ensure that you're happy with the proportions, scale, and silhouette. If you have good reference images of whatever helmet you're trying to replicate, compare your work to the reference with as critical an eye as possible.



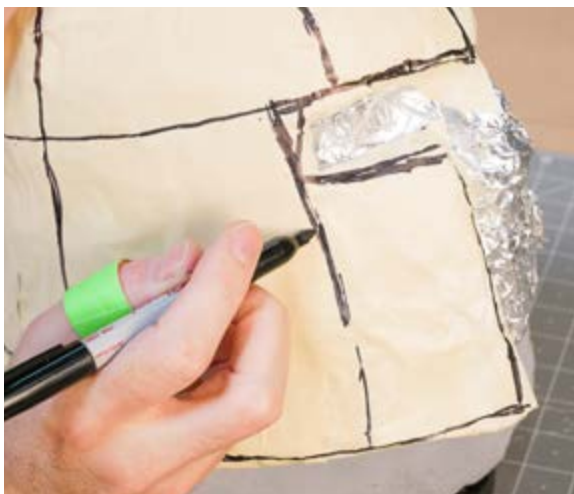
Once you're satisfied with the sculpt (or if you've run out of time, it happens) then it's time to temporarily wrap the entire thing with another layer of foil. Then wrap the sculpt in a good layer or two of masking tape strips, just like we did with the head form.



Again, if your helmet design is skin tight, you would jump straight to this step. Now it's time to figure out where all of the seam lines should go so that we can take apart this three dimensional form and make it lay flat. The goal should be to take it apart in as few pieces as possible. Also, if the helmet you're making already has obvious places for seams, those are a good place to start.



Draw your lines using a permanent marker, starting with any edges that border empty holes like the eyes and neck. Next is the one big seam that goes straight down the middle of your helmet. At regular intervals along these seam lines, add a crossing registration mark. These will be used later to help line parts back up during assembly. Draw additional seam lines wherever you think it would make sense to split the model apart. I try to add them wherever they will be hidden on the final piece by being covered up by additional layers.



It's also worth taking the time to label all of your seams. I like using upper case letters. If you've only sculpted half a helmet, remember that you need to label the middle seam, which is a great place to start. Using sequential letters from the alphabet, label all of the seams so that you know how to put this jigsaw puzzle back together later. I also like to add the side of the pattern, so in this case I added a large letter "R" to all of the pieces. If your helmet isn't symmetrical and you sculpted both sides, be sure to label both the right and left pieces as well as a different letter for every seam on either side.



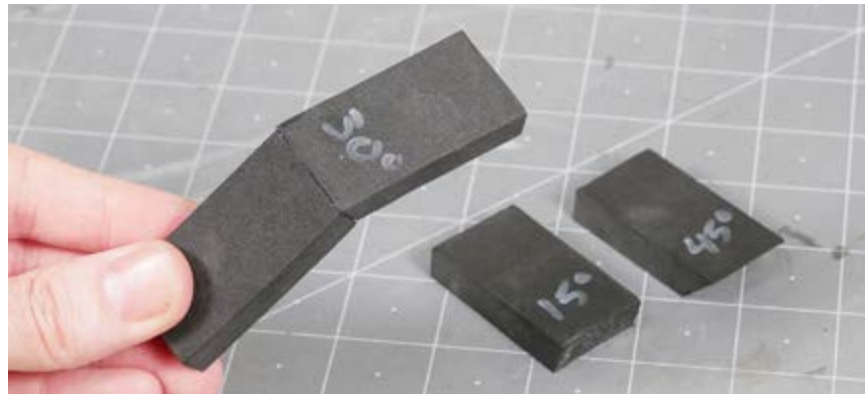
One of the last things you'll need to figure out is whether or not your seams are going to meet flush with one another or if they need to attach at an angle. If a seam needs to have a bevel cut into the edge at a certain angle to get the proper form, a note along that seam will help future you figure out how this whacky form needs to be glued together.



*Do the same thing if your seams should be offset from one another.*



Figuring out those angles may take some trial and error when you're assembling your first prototype. I recommend using some scraps of foam and the sanding drum on your rotary tool to dial in on the angles before committing to the final helmet part.



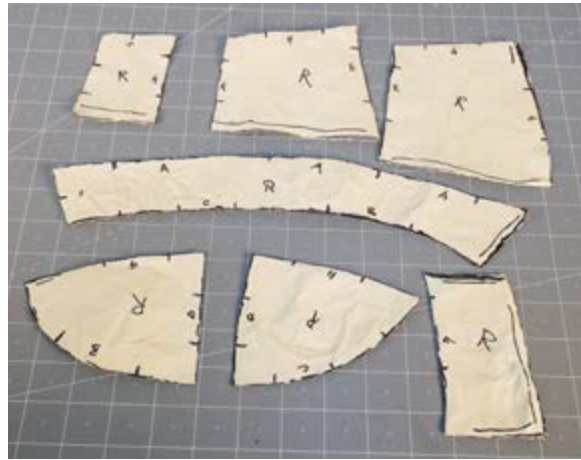
With your pattern all laid out on your head sculpt, you're ready for extraction. Using a sharp hobby knife, start trimming your pattern off of the sculpt. You need to cut through the outer layer of masking tape and the layer of foil just below. Cut through the perimeter of your pattern and try to peel the whole thing off the sculpt. If it doesn't want to budge, you can start trimming the parts along the seam lines to free them from the head.



**SKINNING SKILL INCREASED**

*Don't scrap your foil sculpt right away unless you need to use that head form again immediately. You can still use the sculpt to pattern additional pieces or do the whole thing again in case of some kind of disaster.*

Once the pattern is removed from the head you can use a pair of scissors to finish trimming apart your individual pattern pieces. Try to make these cuts as smooth as possible and then lay each piece flat on your cutting mat.

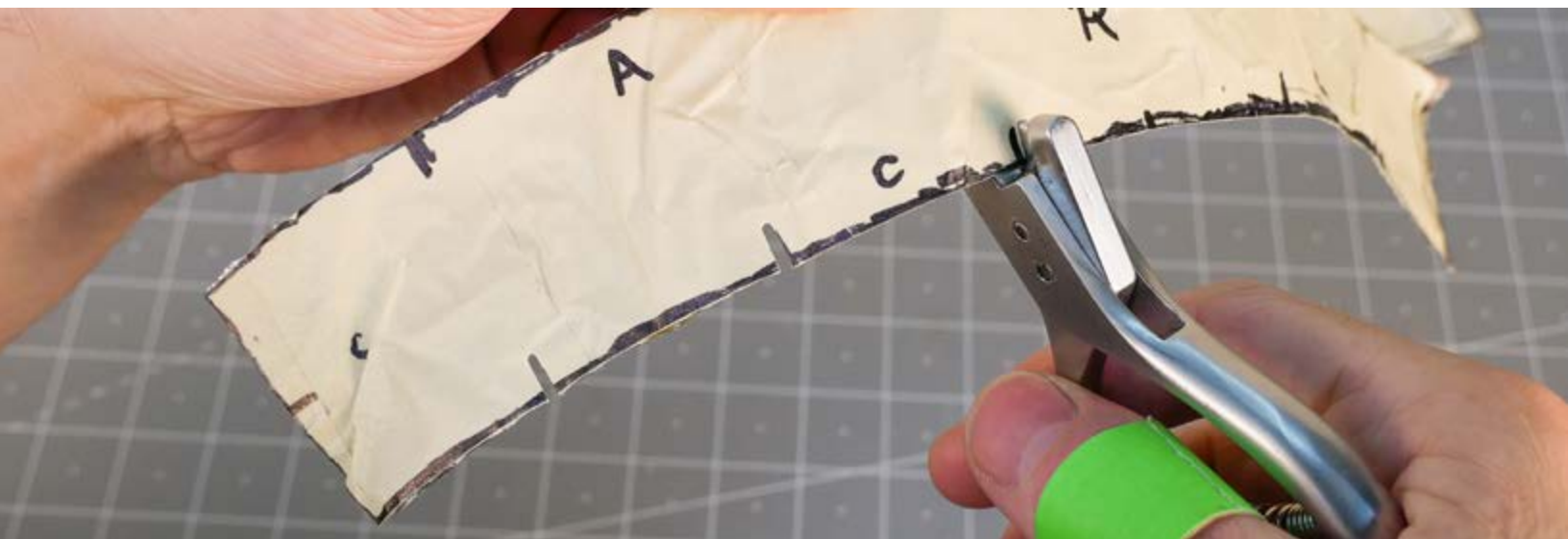


*If some of your pattern pieces are still too curved to lay down flat you'll have to add "darts". These are seams that you cut part of the way through your pattern so that they will lay flat on your material.*

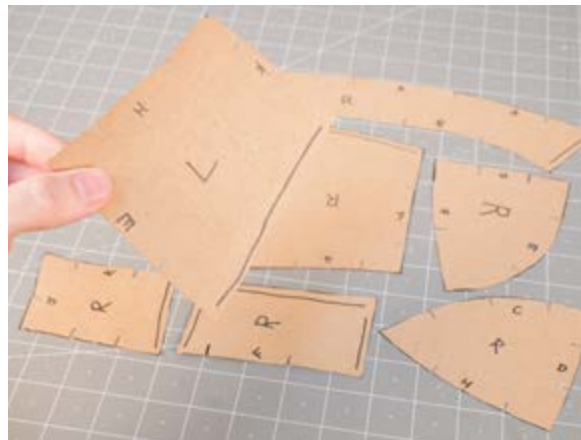
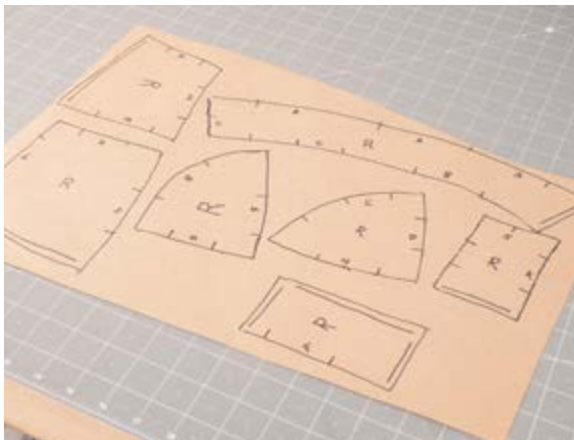
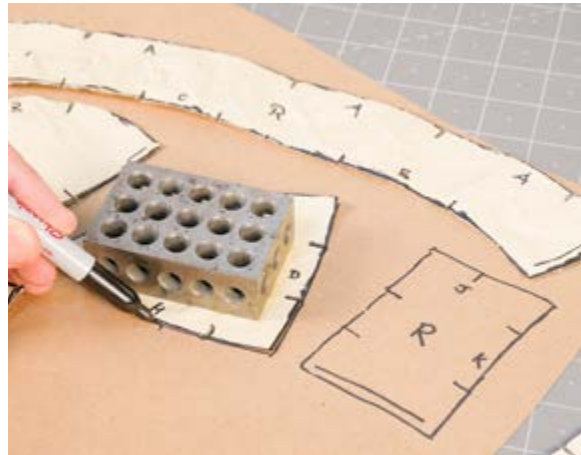


## HOW TO ADD DARTS

The last thing to do is to cut out a notch for all of those registration marks. This can be done with a hobby knife, but if you do a lot of this kind of work, then it's worth picking up a pattern notching tool.



At this point your pattern is technically done, but I recommend tracing the pieces onto something sturdy and flat like a piece of poster paper or heavy card stock. Trace the outlines and registration marks. Also transfer all of your notes, side designations, seam labels, and bevel instructions. Cut all of these pieces out and, if your helmet is symmetrical, flip them over and label the other side with the mirrored information.



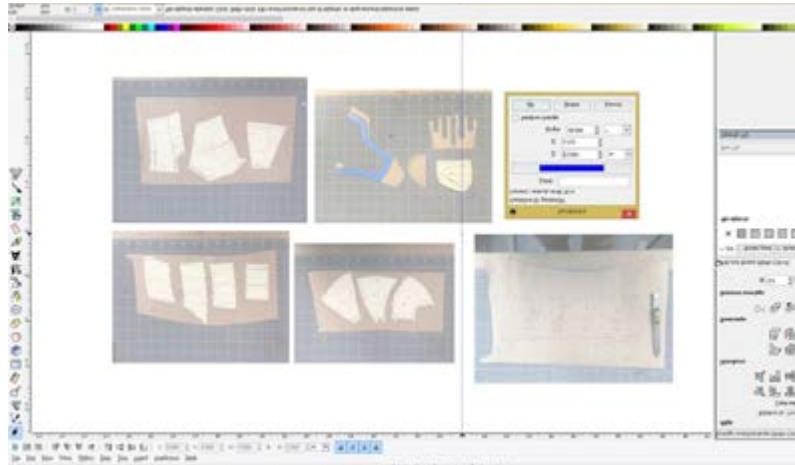
**SYMMETRY MEANS HALF THE WORK!**

Another option, one that I tend to prefer, is to transfer the patterns into a digital format that's easier to clean up and reproduce. It's also much easier to scale the entire pattern once you've traced it as a vector path, just in case you've sculpted your helmet too big or small. In fact, I usually scale my digital patterns up by about 10% by default to account for the space taken up by the thickness of the 10mm EVA foam I usually use. This is especially handy when your helmet is meant to be skin tight.



If you have a scanner for your computer, then you can scan each piece along side a ruler, to help you scale the part. If you don't have a scanner, you can take photos of the pattern parts with your phone. I like to take these photos on my ruled cutting mat, so that the photo can be scaled correctly in my vector drawing software.

Those photos or scanned images are then brought into a vector drawing application like Inkscape or Adobe Illustrator. I'll use the rulers in the software to scale my images to 100% of their true scale.



Next I'll use the pen tool to trace my pattern edges, adding the labels and registration marks as well. What's great about this digital form is that you can tweak the edges to make sure they're nice, smooth curves. I try to make my lines using as few nodes as possible. This tends to create extremely smooth seams that look fabulous when they're glued together.



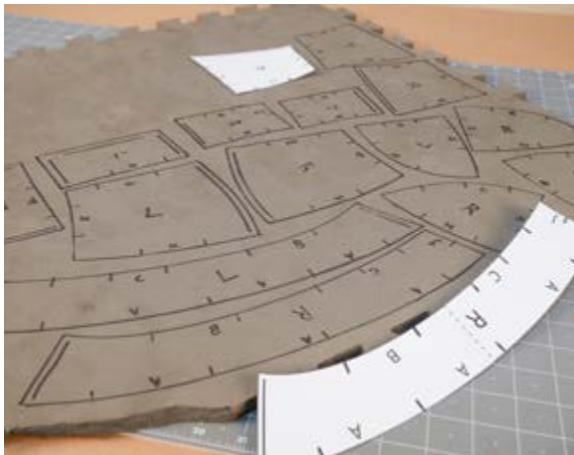
*If any of your individual pattern pieces end up being larger than a single sheet of paper, you can split them up into multiple pages and tape those two pieces of paper together after printing them out.*



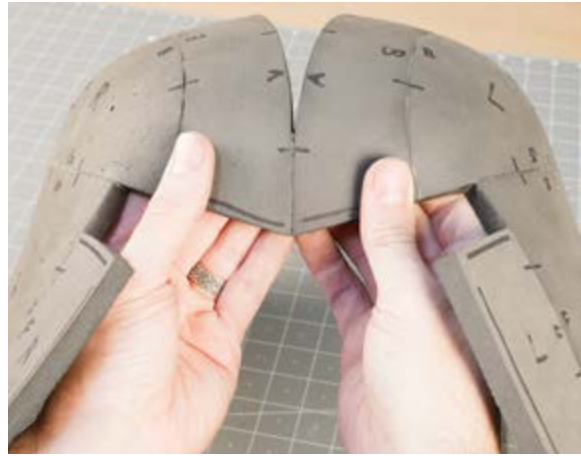
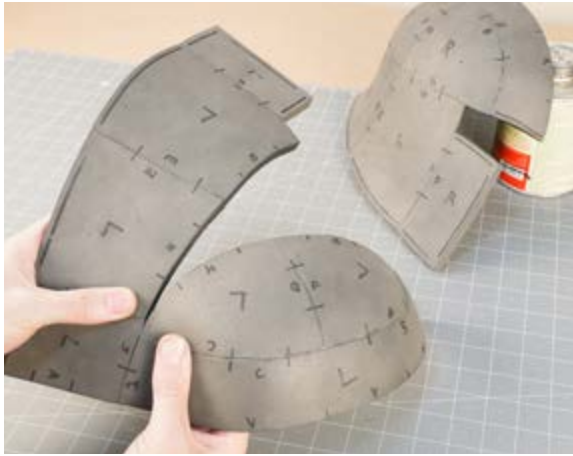
Once your pattern is laid out in digital form, you can print out a copy onto paper or heavy card stock and start assembling the first draft of your helmet (more on assembly in the next chapter). I usually do this draft using cheap floor mats. Heck, I've even pulled dirty old floor mats out from under my feet to use to make a helmet prototype! This is a standard foamsmithing practice. Trace out all of the parts onto your foam and cut them all out according to your notes. Remember to include any bevels on edges that require them. Those bevels can be cut as you trim the parts or can be added later with a rotary tool.



Assemble this base helmet form with your favorite glue and methods (I prefer contact cement), but most importantly, take your time. Pretend this is the final helmet and take care to assemble all of the parts to the best of your ability. You don't want your results to be skewed because you rushed.



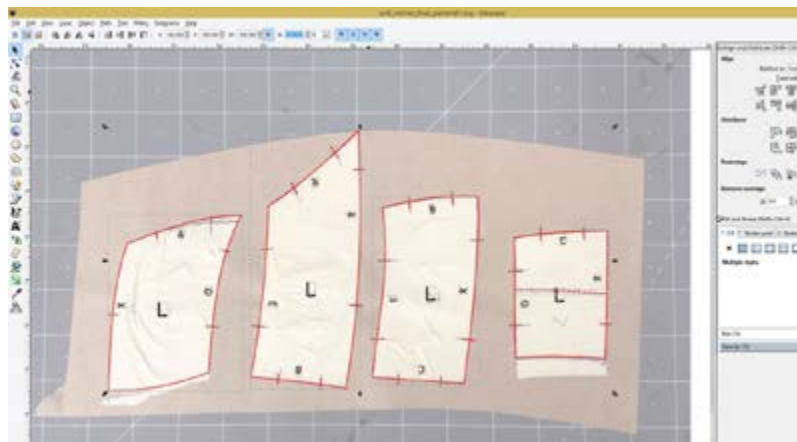
*You'll want to heat-form all of your parts prior to assembly. We'll cover the full assembly process in the next chapter.*



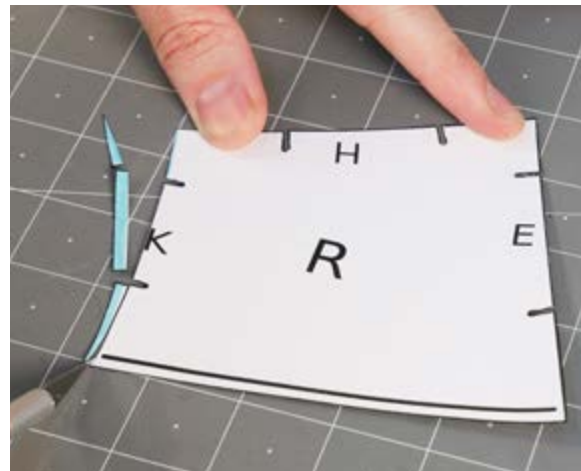
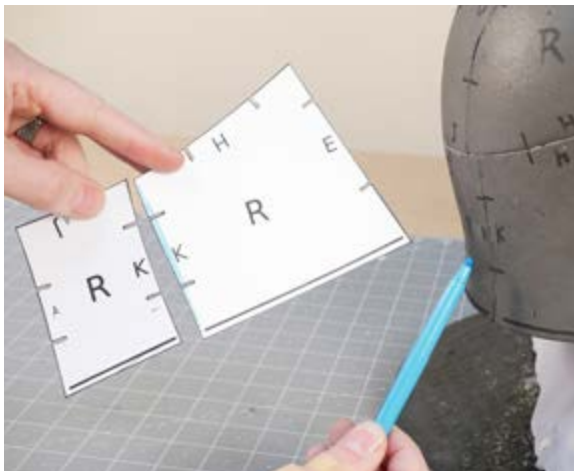
You might get lucky and this first draft just might be perfect. The odds, however, are not in your favor. That's totally OK. I always find something that needs tweaking on my helmets after the first attempt, especially after trying the helmet on my real human head. Knowing what to tweak comes from asking yourself a set of objective, critical questions.

- Did I nail the silhouette from the front, side, and  $\frac{3}{4}$  views?
- Are any of the seams bulging in a weird manner?
- Does it fit onto my head comfortably for extended periods of time?
- Are all of the functional features, like eye holes, in the correct position?
- Are the proportions correct?

If the answer to any of these questions is “no” then it's time to figure out what you need to change. If the helmet is too small or uncomfortable, you can scale the whole pattern up (especially easy if you drew your pattern as a vector path).

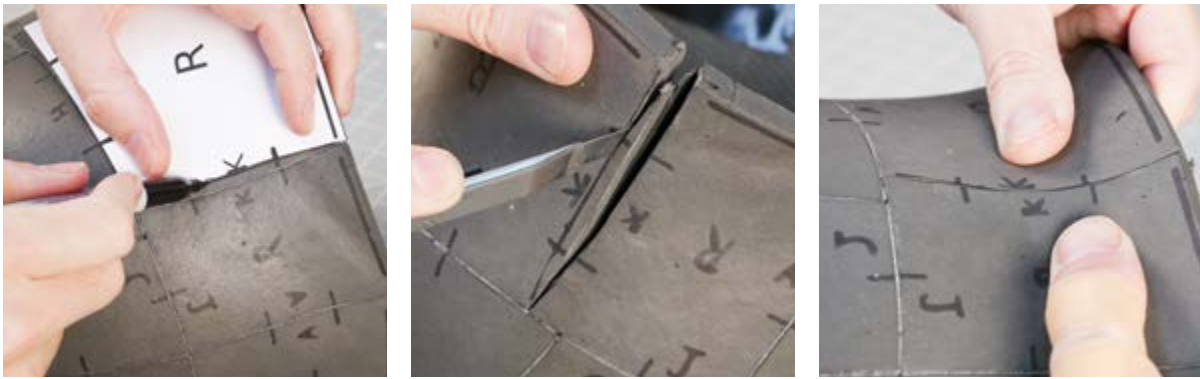


If your seams create weird, bulgy sections of your helmet, you may need to smooth out the curves of those seam edges on your pattern. Little tweaks to the shape of those curves can have a drastic effect on the three dimensional form of the helmet.



**ENHANCE CURVE**

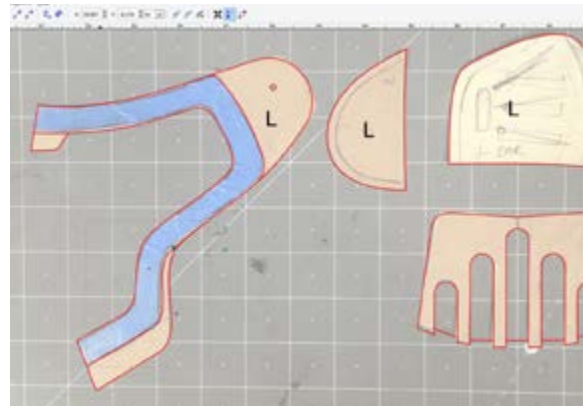
To update my seams, I will usually cut my prototype helmet back apart along the seams in question, trace the new curve edge, trim off the excess foam, and reassemble the helmet. This can be done over and over again, updating your patterns as you go. If you have any moving parts, like a pivoting visor, now is the time to really figure out the exact correct position of the pivot and whether or not the piece can move freely through its full range of motion.



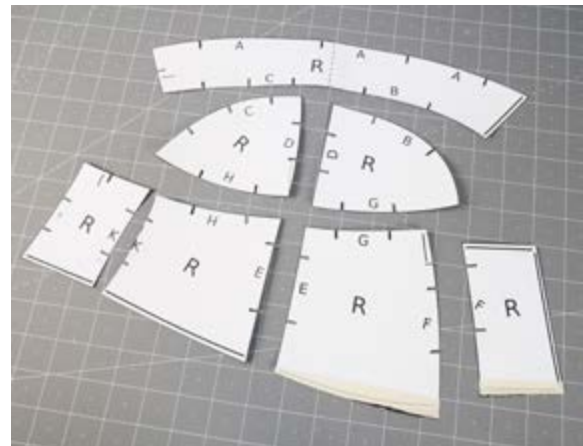
I will usually end up with a Frankenstein's Monster looking helmet that's been modified nearly to death, until it's as close to what I want as possible. From that helmet I can decide if I need to move the position of any of my seams to a spot where they will be covered or less noticeable. It is possible to move your seams, but it can't be too drastic of a change without risking altering the final form of the helmet.

If you do make any changes, trace all of your new seam locations with a bold marker and then cut apart your prototype helmet along all of those new seam lines. The newly cut out foam pieces can be used to create the final set of patterns that you can dump into the computer and trace again.

If you didn't change the location of any of your seams, you might be able to just update your first set of paper patterns to move forward, but I would still recommend updating your digital patterns with any alterations in case you need to print another set of patterns. I'll take new photos of the edited prototype patterns, toss them in Inkscape, and use them to make changes to the original patterns.



Now that you've confirmed the pattern for the base of your helmet is correct, you can finally get out the good sheets of foam and start building the final helmet. I know this process seems like a lot of tedious work, but if you're making a helmet that isn't a standard helmet shape, then this iterative workflow is the best way to sneak up on the design. It gives you the best shot at absolutely nailing the look you're going for. This type of patterning is extremely versatile. You can use it to replicate any crown, mask, or helmet. Heck, you could replicate just about any complex 3D form with this process!



# CUTTING AND ASSEMBLING YOUR FOAM HELMET

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I've covered the cutting and gluing of foam parts extensively in the previous two books in this series, so I'm not going to retread too much on that ground. However, there are a handful of things that are worth noting specifically when assembling a helmet. There are also several advanced techniques I'd like to sprinkle into the mix.

## Cutting Your Foam

All of your foam cuts can be made with a sharp knife, but I tend to prefer to make cuts with my band saw for greater accuracy and efficiency. There is another, more high tech option; lasers. A powerful enough laser cutter can totally cut EVA foam! If you traced your pattern into a vector application, those path files can be used to tell a laser cutter how to cut out your patterns. It's a truly magical process and extremely handy if you need to cut out parts for several helmets.

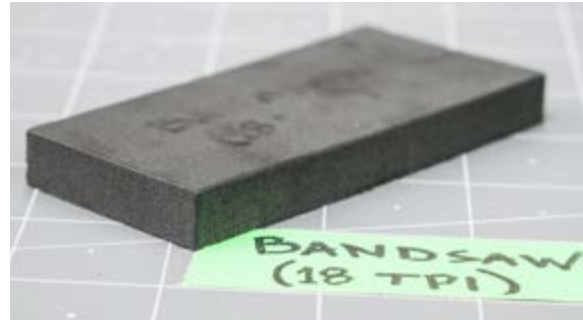
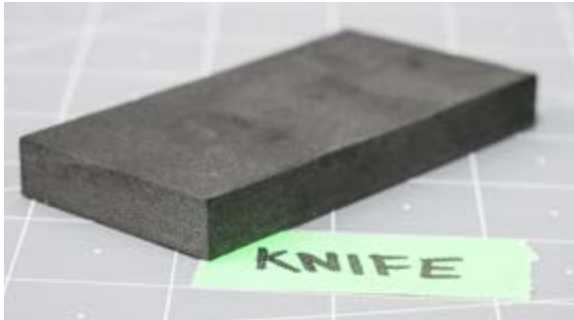


In the past couple of years it's become much more commonplace for a hobbyist to have a laser cutter in their home workshop, but it's still a rather expensive tool. If a laser is outside your budget, I recommend looking for a local maker space that has a laser cutter and will let you rent time. Fortunately EVA foam is far less dense than something like wood, so you should be able to zip your pieces out quickly and cheaply.

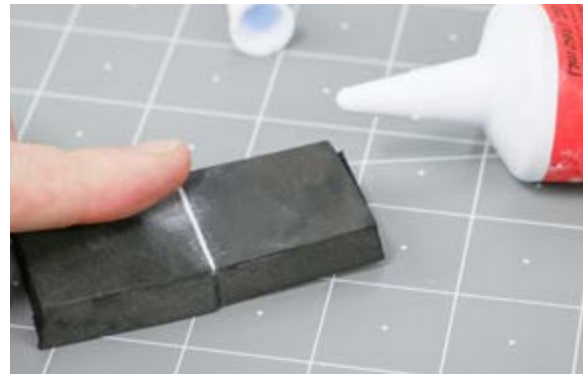
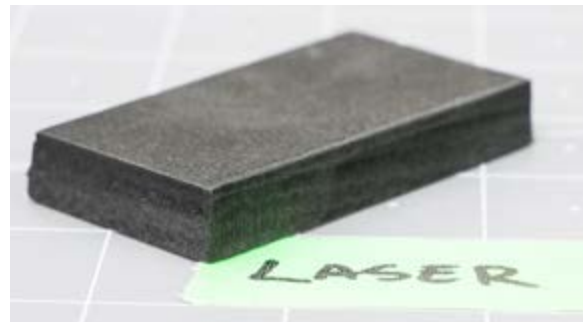
***WARNING: When EVA foam is melted by a hot knife, laser cutter, or an exuberant heat gun, toxic fumes are dispersed into the air. These fumes shouldn't be inhaled and need to be vented outside or vented through a special laser cutter filter.***

Laser notes: The power on my laser is 45 watts and is designed to cut through as thick as  $\frac{1}{4}$ " (6mm) of wood. I've found that I can run the cuts a couple times along the same paths and cut through EVA foam as thick as about  $\frac{1}{2}$ " (12mm). Most lasers that you find at maker spaces will be at least as powerful as my 45w hobby laser.

One interesting side effect of cutting with a laser is a slight round over it leaves on the top of the cut edge. My guess is that this happens because the heat from the laser causes the foam to shrink a little bit, pulling some material away from the cut edge.



This round over can be a bit of a problem when you're trying to glue a seam together and you want it to be as flush as possible. If each edge has that round over, then you'll end up with a slight trench all along the seam on your helmet. If you planned those seams to be covered up by subsequent layers of detail, then you're OK, but if you were hoping that seam would be as invisible as possible, you'll have to do some filling with an adhesive caulk (covered in Foamsmith 2).



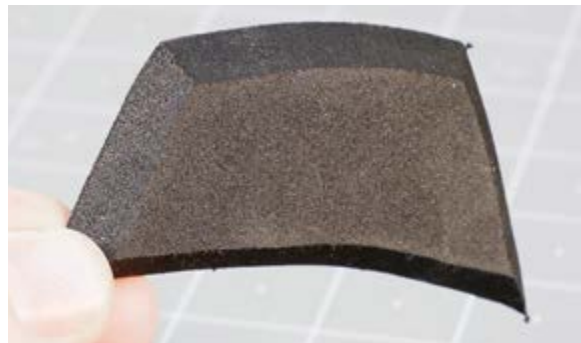
**FILL SEAM WITH WATER BASED CAULK**

A laser can also be used to etch details into just the surface of your foam. You can run the laser at a lower power to cut into the foam, but not all the way through. This is a great way to add embossed details that look like they've been machine made, like text.



## LASER ETCHING

While a laser cutter is an incredible machine, there is one thing it absolutely cannot do: cut bevels. The laser beam is designed to be as perpendicular to the cutting surface as possible and it cannot be tilted one way or the other, so 90 degree cuts are all you'll get from a laser cutter. I recommend using the laser to only etch the edges that require bevels; setting the laser power so low that it only leaves a faint line instead of cutting all the way through the foam. Then you can use a knife or band saw to make that cut at the appropriate angle.



Whether you use a knife, a saw, or a laser, all of those helmet pieces need to be cut out as carefully as possible before we can move forward. The tidiness of those cuts will determine how well your helmet assembly comes together, so take your time. If some of your cuts aren't perfect, make sure to sharpen your blade for the next cut and use your rotary tool to clean up the uneven edge.



# PRE-FORM YOUR PARTS

Of all the weird forms that armor can assume, helmets tend to be the most demanding on EVA foam. The transformation from flat stock to a rounded, three dimensional object is a lot to ask for such a humble material, so we need to give it all the help we can. I'm talking about using heat and a little persuasion to pre-form our foam pieces into a rough approximation of their post assembly form.

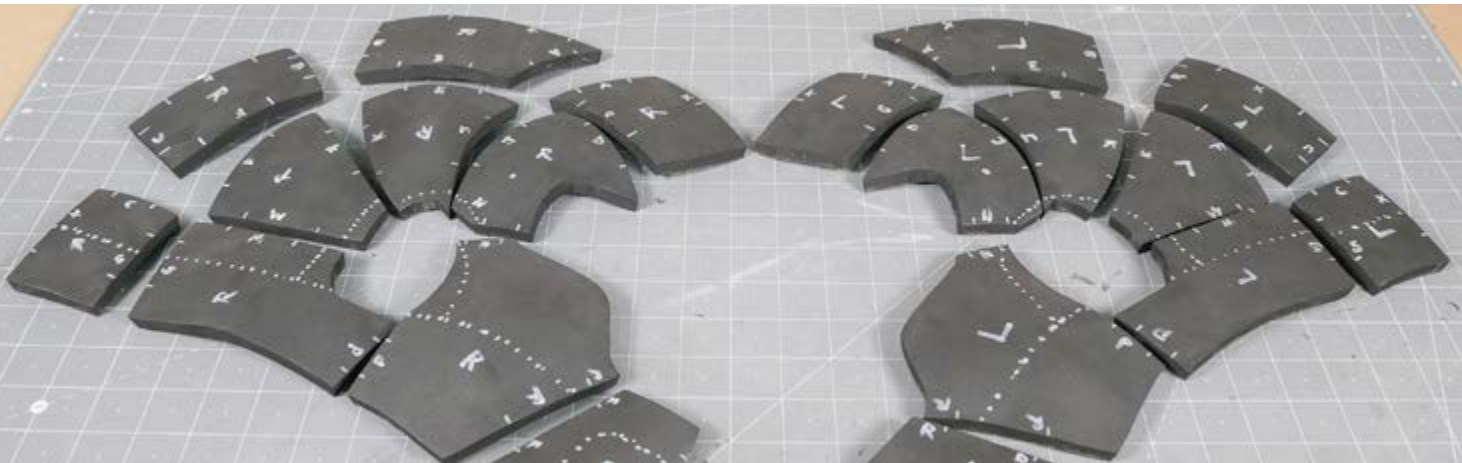
For this you'll need your favorite heat gun (no, a hair dryer won't cut it) and something round to help with the forming. I have a "foam anvil" that my pal Evil Ted Smith made for me, but you could use the back of a small bowl, a trailer hitch, or any other small, round, rigid fixture. Then use your heat gun to warm up both sides of one foam part. It should get hot enough that it's nice and pliable, but not so hot that you'll burn your fingers. If the foam starts to burn, you've gone too far.



When your foam piece is nice and toasty, use your hands and, if you have one, your forming tool to start massaging the foam into a concave form similar to what that piece will look like once it's all assembled. This doesn't need to be perfect, you just need to give it a nudge in the right direction; help the foam decide what it wants to be when it grows up.



Make sure that you're bending the foam in all necessary directions. This creates a complex curve and it's a critical step for creating your foam helmet. Once all of the parts have been pre-formed, it's time to move on to glue.



# GLUING YOUR SEAMS

Properly attaching the edge of one piece of EVA foam to another edge of EVA foam is the kind of thing that takes a lot of practice and patience. If there's a part of the process where you're most likely to goof up, this is it. Fortunately, I have a list of the most common problems with a good seam glue-up.

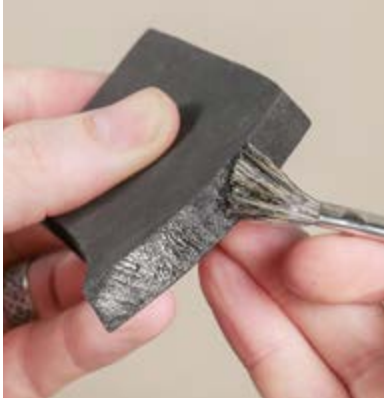
- Foam Edges Weren't Cut Clean
- Not Enough Glue
- Way Too Much Glue
- Rushed Attachment



Like I mentioned earlier, making sure the cut edges of your foam are perfectly smooth will help more than anything. For the actual gluing, I prefer contact cement, like Barge. Even the most hastily applied Barge will create a ridiculously strong bond, even stronger than the foam. In our craft, strength isn't everything; it needs to look good too.

**WARNING:** *These types of contact cements give off some nasty vapors, so you'll want to make sure you're working in a well ventilated area wearing an appropriate respirator with organic vapor filters.*

How much of that contact cement should you use? I try to get a nice, thin layer on the exposed edge. Most importantly, I make sure I brush the glue all the way to the outer edge of the foam and I brush over each area a couple of times to make sure the glue is massaged into the surface. If there are any obvious pools of glue where I've applied too much, I try to spread it out along the edge. Then I give it 5-10 minutes to dry. You'll know it's dry when the wet glue is no longer shiny.



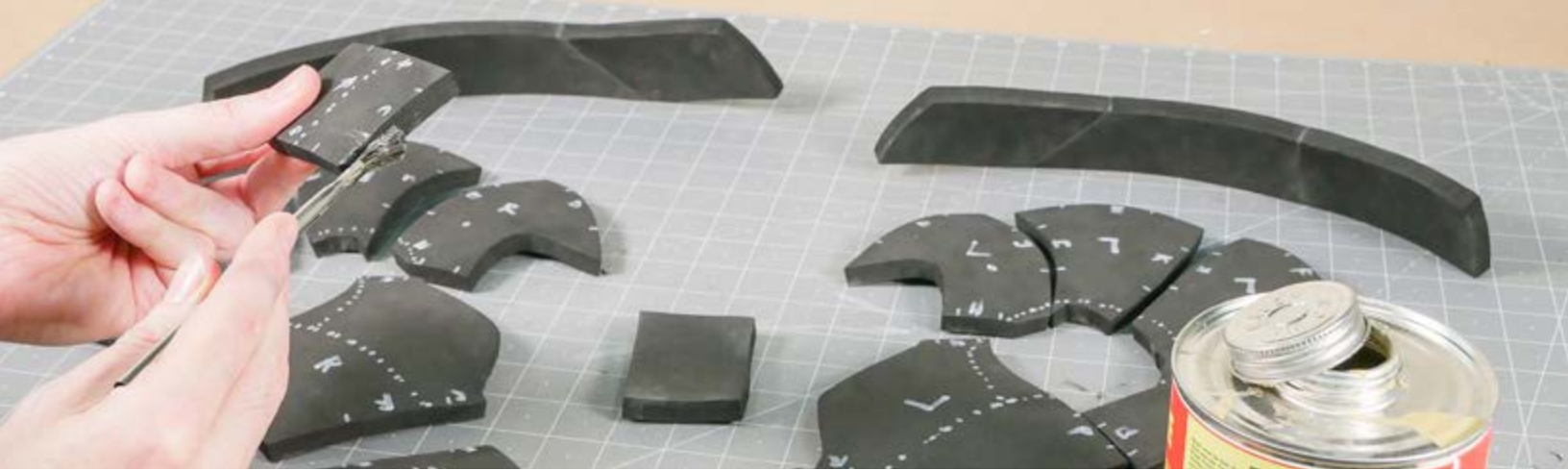
*If your contact cement is taking too long to dry, you can help it out with a hair dryer on a low setting.*



One good layer of Barge is usually enough for these kinds of seams, but if you're using a different brand of glue or you just want to be damn sure these seams won't fall apart, it's worth spreading on a 2nd thin layer of your contact cement. This layer goes on just like the first, making double sure that you've brushed all the way to the outside edge of the foam. Then, you guessed it, wait another 5-10 minutes to dry.



**WAIT UNTIL DRY**



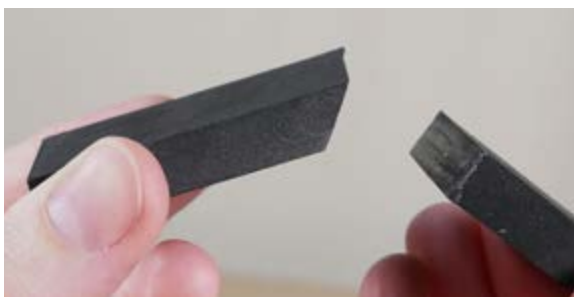
Finally it's time to glue all of your parts together to create the base form for your helmet masterpiece. I usually prefer to glue together all of one side, all of the other side, and then glue the two halves together.

If you're like me and you try to work as efficiently as possible, it can be extremely satisfying to get into a rhythm with this kind of work. I like to get into a groove where I'll brush contact cement on a couple of pieces and while they're drying I'll assemble the pieces I just glued up 10 minutes earlier. Rinse and repeat. That way I always have some glue drying while I assemble all the parts and I never have any down time when I'm just waiting for glue to dry.

When I'm pressing together my glued-up foam edges, I first focus on making sure the two surfaces are nice and level. When they touch, even gently, the contact cement will hold them securely in place. I slowly work down the entire seam until it's all stuck together and then I'll go back over it and press extra hard to be totally sure the seam will not come apart.



*Depending on the specific design elements of your helmet, you may need to intentionally skew or bevel your edges before attaching them together.*



While you're attaching your foam parts together, there are two critical things to keep in mind. First, take your time. As soon as your Barged foam edges touch one another they're going to stick together with extreme enthusiasm. You want to make sure they are nice and level with one another on the first try.

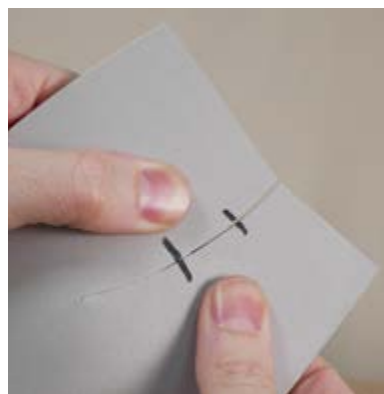
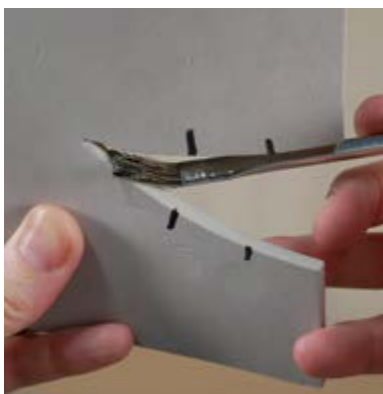


Second, follow your notes. The labels and registration marks you made for your pattern are your instructions for how this helmet is assembled. It can be frustrating to glue a part meant for the left side on the right side by accident. Properly labeling your pattern and following those directions will make your helmet making journey a lot less painful.

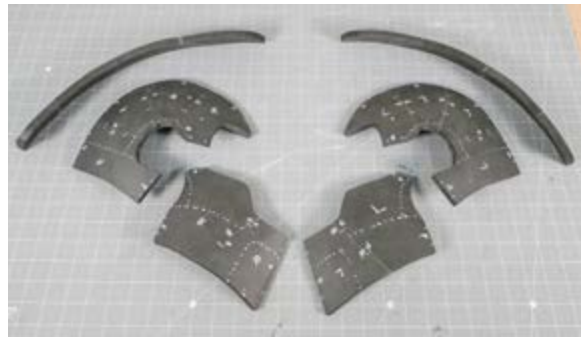
***An incorrect glue-up isn't the end of the world. Barge makes a thinner that will allow you to remove an attached piece of foam. WARNING: The fumes from the thinner are pure bad stuff. Wear the proper respirator and vent the fumes outside.***



As for which pieces should be attached together first, I recommend starting with darts. It's easier to work with parts like that before they've been attached to anything else. Other than that, each helmet is going to be different, so the order of operations for each one will vary.



After that, I recommend putting together each side of your helmet separately before joining the two halves together. Depending on the design of your helmet and the placement of your seams, you may need to attach pieces in a specific order. That order will become apparent as you attempt to assemble the first prototype of your helmet.



Taking your time, using your materials correctly, and paying attention to your notes are practices that will propel your maker skills into the next level. Don't be intimidated if you need to make and remake your base helmet several times to get it just right. This completed form is now the foundation from which you'll build the rest of your creation.



# ADDING DETAILS TO YOUR HEAD GEAR

If everything has gone according to plan, you now have a helmet form that more or less fits on your head. Awesome, you're doing great! The next step is to start adding all the fancy details that will make your helmet feel like it's pulled right out of a fictional world. There are several ways to do this.

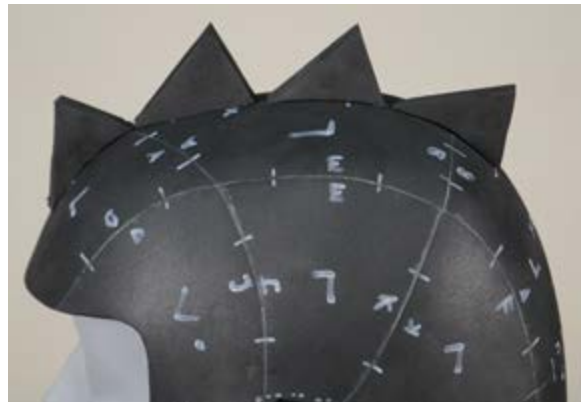
*Place your helmet back on your head form to hold it in place while you work on additional details. Level up: put all of that on a lazy susan so you can spin your work around freely.*



Many of the details you add will be the same shape as the surface of your helmet form, but they'll either be carved into, or added to, that surface. These are details that don't drastically change the form of the helmet, they just add surface detail.



Other details are a bit more drastic. These are three dimensional protrusions that drastically change the form and silhouette of your helmet. I'm talking about additional assemblies, spikes, antennae, or horns.



### Simple Surface Details

Simple surface details are fairly straight forward. If you need to plot out a pattern, you can cover an area of your base helmet with several pieces of masking tape and draw your pattern directly on that tape. This way you can plan the location and shape of those details relative to the helmet form. Then, when you peel the tape off, you can use it as a pattern to cut out the next layer of detail. This layer can be whatever thickness of foam is necessary to get the look that you want.



For these additional layers, I try to add every bit of detail to that smaller piece before gluing it down to the helmet. This could include beveling the edges, cutting in detail lines, gluing additional pieces, or punching holes through the part.



To attach a piece like this, I'll hold it onto the helmet in the correct position and trace around the part with a pen or a marker. Then, when I remove the part, I know exactly where to brush on my contact cement and where to place the part when the glue is ready for application.



*For smaller parts I prefer to use super glue (medium viscosity if you can find it, the thin stuff is too watery). I find it much easier to apply a little bit of super glue than trying to brush contact cement on a tiny surface.*



*Pins can be used to temporarily attach pieces while planning.*

I use 2mm thick foam all the time for adding surface detail. One of my favorite tricks is to cut it into thin strips to use as piping. Since the foam is flexible, these strips can be curved and bent to any shape, making them extremely useful for intricate details.



You can do something even fancier with EVA foam dowels. If you carefully cut a foam dowel lengthwise, you'll end up with two half-round pieces of foam piping. These are incredibly handy for adding a rounded over trim to the edge of your helmet. The same can be done with any number of differently shaped foam dowels.



*You can make thin trim pieces like this in any shape you want! A band saw with a fence and a tilting bed is a super efficient way to make a plethora of foam trim in a wide range of profile shapes.*

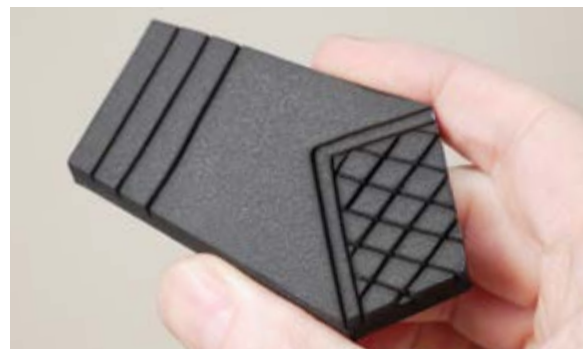
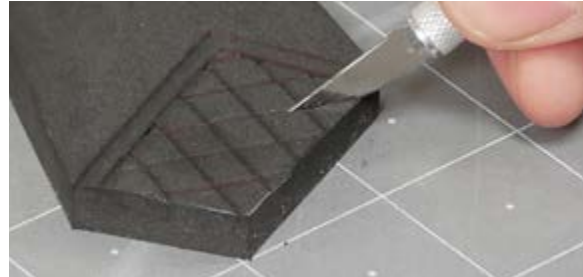
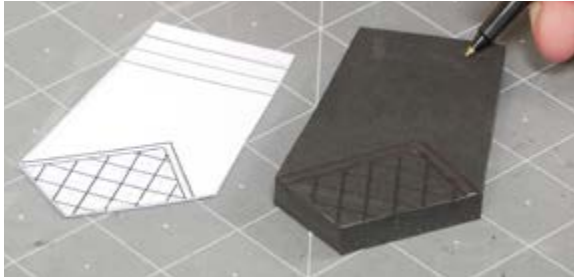


If the design allows for it, thin detail strips like these can be phenomenal for hiding seam lines. That's exactly how I hid the seam lines on Astrid's helmet. I planned for the seams to be located in a spot that would be covered with a thin strip of foam later. Hopefully at this point you're starting to see why it's useful to tinker with a couple of prototypes to figure this stuff out.



**SEAM? WHAT SEAM?**

Sometimes, instead of adding raised detail, you need to cut details into the surface of your helmet. The tried and true methods of past Foamsmith projects still hold true here. Scoring the surface with a sharp knife and then using a heat gun to open up those cut lines is a really magical way to add more intricate detail (I recently learned that this will not work on foam clay, which doesn't behave exactly like EVA foam).



For something a little more drastic, a hot knife or soldering iron can be employed to melt your design right into the surface of the foam. The fumes are, of course, toxic, so make sure you're wearing the appropriate lung protection and working in a well ventilated area. You can use this technique to make robotic panel lines and geometric shapes, but it really shines when you need to make something that has a more organic feel, like wood.



Sometimes you need a clean, sunken detail in a piece of your foam helmet. Start by tracing the shape you need onto the surface. Then, cut that piece out extremely carefully with your sharp knife. You don't want to over-cut, especially in the corners. You also want to make sure your blade is cutting perpendicular to the surface of the foam. This can be challenging, so I recommend practicing on a scrap of foam before committing to cutting a hole in the helmet you just spent three days making.

The cuts need to be made perfectly, because the inside part of the cut is going to be reused. Once it's been liberated from the main foam piece, you should be able to push it into the face of your helmet, extruding that shape into the helmet. How far that piece gets pushed into the surface is up to you and the design.



*I hang on to little interesting bits of detritus that I find in the world. Any of these pieces that are particularly nifty get molded in silicone so that I can cast multiple copies out of materials like urethane resin, foam clay, or hot glue.*



### Large Additions

Many of the additional details you add to your helmet will not be simple surface embellishments. I'm talking about adding additional cosmetic forms, spikes, horns, antennae, and any other protruding, three dimensional forms.



Just like the rest of your helmet, these additional parts can be made from more EVA foam, but I usually end up using a variety of materials along with the foam to create something that both looks correct and has enough structural integrity to hold its own weight. For example, the base form of our Draugr Deathlord (Elder Scrolls V: Skyrim) horns were made using thin EVA foam. Those were back-filled with a rigid expanding foam and then the EVA foam was removed. The rigid foam was then covered in strips of a thermoplastic (Worbla) to create the ridged look of animal horns. In hindsight, this was probably overkill. You can totally make horns like this from only EVA foam, but our solution worked and it looked good, so I'm still happy with the outcome.



**MIXED MEDIA**

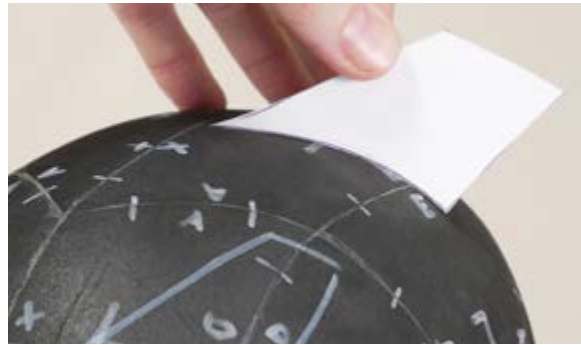
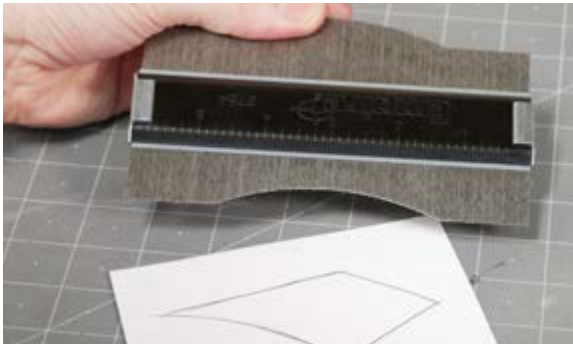
The spikes for Astrid's helmet were made entirely from EVA foam. They're short enough that the foam can support its own weight. The Mechanist antennae, on the other hand, were far too thin to make from EVA foam alone. I could have embedded a wire in the middle of a foam dowel to make it less floppy, but it wouldn't have been as clean of a finished product as the 3D printed piece. Also at the time of building that helmet (circa 2016) EVA foam dowels hadn't been invented yet!



Sometimes you'll need to add some kind of large, additional form to your helmet. Depending on how complicated a piece like this can be, you may want to make a full pattern from scratch. You can even tape up that part of your helmet, get your aluminum foil, and sculpt the part directly on the surface.



*If you need to cut a piece of foam to fit along a specific curve on your helmet, use a contour gauge to map out the surface and transfer that curve to your pattern.*



This new sculpt can be patterned just like the rest of the helmet and then constructed out of more EVA foam. I like to treat parts like this as subassemblies. I try to do as much work on them as possible before attaching them to the main helmet form. It's much easier to work on only the small part than manhandling the entire helmet. Sometimes I'll wait to attach these parts until well into the painting process to save myself the time of masking certain parts. It's all about figuring out the most efficient order of operations.



Sometimes, especially if you plan on traveling with this helmet, it makes sense to make these additional parts removable. This is definitely the case for my tall Draugr helmet. Try convincing the TSA that this helmet is your “one personal item” and it’ll totally fit under the seat in front of you, I dare you.

We made those horns removable by inserting a T-nut into the bottom of the horns and threading a bolt through the helmet into that nut. These get unscrewed and detached when we pack them into our luggage and then reassembled when we reach our destination.



Another amazing way to attach things to your helmet is with magnets! Foam usually ends up being fairly lightweight and, as long as you use enough magnets, it can be a fantastic way to stick something to your helmet and remove it on a whim.

I recommend also building these parts with some kind of mechanical pressure fit along with the magnets. Since foam flexes, you can usually force one form into another, similarly shaped hole and the friction should be enough to hold the part in place. Add magnets to the mix and you can be double sure your horns won't fall off in the middle of the Dragon Con rave.



## Organic Helmet Styles

Most of the EVA foam materials we work with lend themselves well to creating helmets that are geometric. The hard edges and smooth surfaces of scifi, cyberpunk, or medieval armor play well with foam sheets and dowels. The organic look of fantasy and horror head wear can be a bit more tricky to pull off with EVA foam, but it isn't impossible.

I usually start these projects by building the base helmet and adding layers of detail on top of that base. Those additional layers are treated a bit different than on a more geometric design. These layers are intended to add more bulk to the helmet than you need so that you can use a variety of tools to sculpt that foam down to the organic form you desire.

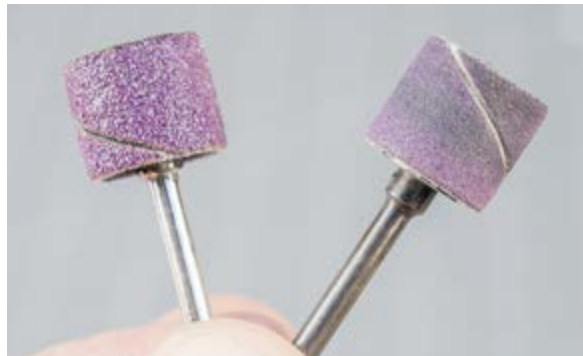


The real trick with this technique, is adding enough foam so that you can carve into both the base form and the addition in a way that you make the two pieces meld into one another. My main weapon for this foe is my rotary tool, starting with an aggressive sanding drum to remove foam quickly.

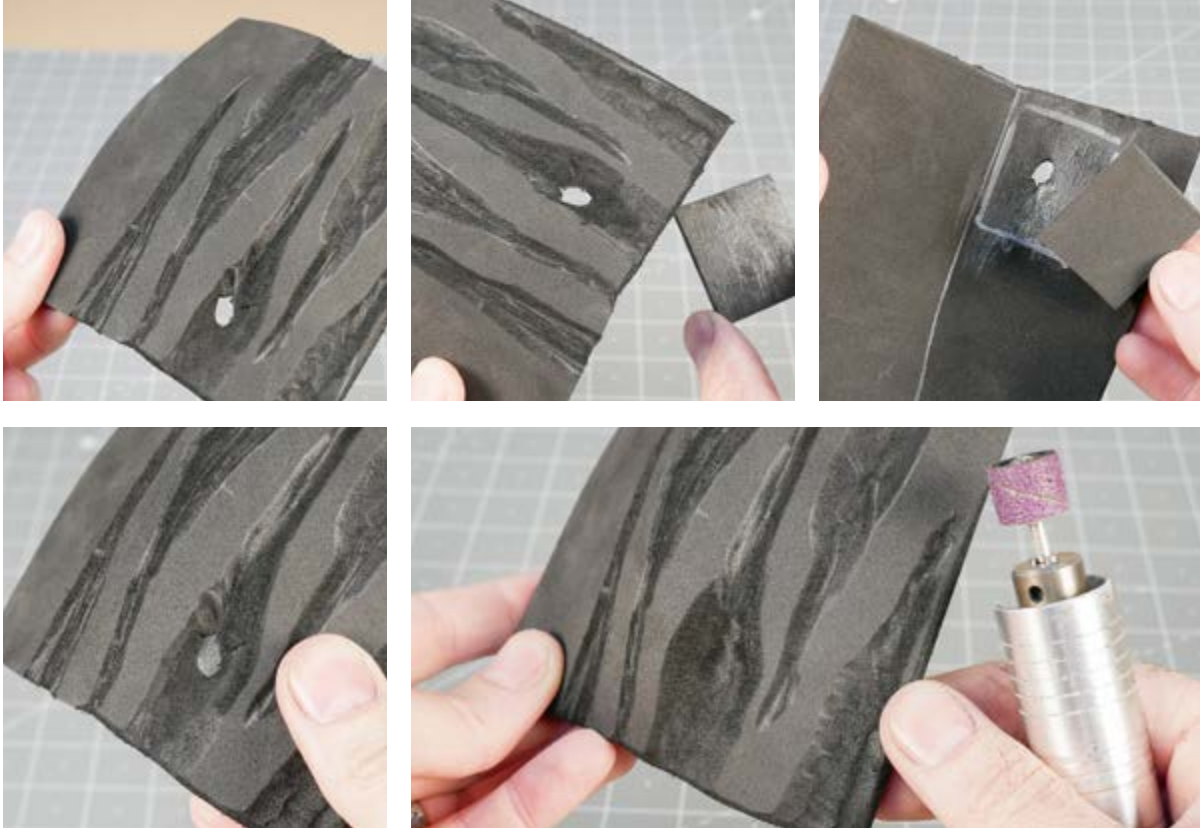


This is definitely the kind of technique that requires a bit of practice to get the hang of, so I highly recommend practicing on scrap foam until you're comfortable.

This type of rotary tool sculpting can be used to create a variety of forms and textures on your helmet surface. Combined with a hot knife, you can add runes, battle damage, wood grain, pock marks, and any other fun surface texture you can dream of.



*If you accidentally sanded a hole right through your foam, fear not! Simply glue a new piece of foam over the hole (or behind it, or both if necessary) and continue sculpting.*



Combine that with using more hard edged looking pieces of foam (like those 2mm strips I talked about earlier) and you can layer a wide range of forms and textures, creating something truly wonderful.



More than any other type of foam fabrication, I think this kind of sculpting requires the most amount of practice, so don't get discouraged if your first attempts don't end up the way you pictured in your head. It is a kind of fabrication that I'm still not totally comfortable with myself; I haven't put in enough hours, not yet anyway. Fortunately for me, there's a new material on the scene that is a bit more forgiving.

# FOAM CLAY SCULPTING

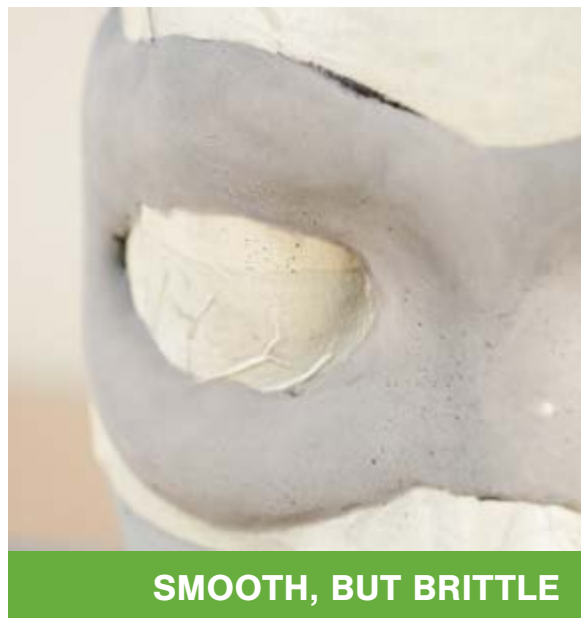
What is this marvelous material? While it's called "clay" I think it acts more like a rubbery putty. It's definitely not EVA foam, but once it's fully cured it shares some of the same properties. Most importantly it's lightweight, which makes it great for sculpting anything going on your head. It's also non toxic and air drying, which makes it safe for working indoors.

You could use this clay to sculpt an entire helmet or mask. You could also use it selectively to add sculptural elements to a helmet.



What I love about foam clay is how much time I have to work with it in a clay-like state before I have to commit to a final sculpt. I can work and re-work a part of a sculpt for a good half hour until I'm totally happy with the results. The changes I make aren't permanent until I let it cure, unlike the rotary tool which makes permanent changes with stunning efficiency.

I also love the smooth surface finish the clay gets once it's fully cured. It does take a good day or two to dry completely (or more if any part of your sculpt is particularly thick), which may discount it for any speed builds, unfortunately. Once it is fully dry, however, the exterior surface finish is extremely smooth and easy to paint. A similar sculpt done only with a rotary tool in normal EVA foam is going to have a bit of a fuzzy texture that you'll have to deal with.



Since the clay will air dry as you work, it's best to work in small batches. It would be a waste to cover your entire mask in a layer of foam clay only to have most of it dry up before you have a chance to sculpt any details into the surface. Fresh batches can be blended with an already sculpted area using water. You can even blend fresh foam clay onto an area that's fully cured.



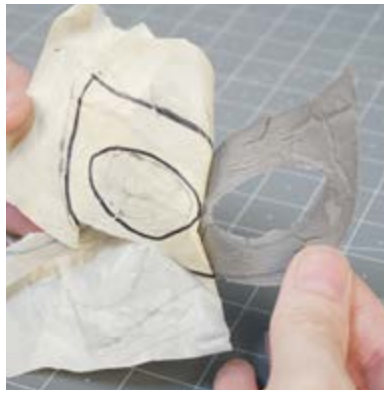
*Since foam clay air dries, make sure you put any unused material back in a plastic bag and remove as much air as possible. Leaving an entire bucket of foam clay open to the air while you sculpt means a lot of that clay will have started drying by the time you try to use it again.*



**REMOVE AIR**



If you wanted to sculpt an entire mask directly on to your head form, you can. You should first cover the head form in masking tape to prevent the clay from bonding to your head. Then you can sculpt a mask directly onto the face and around all of the facial features. When the foam clay fully cures you can peel it off the head form and it should fit nicely onto your own face.



You can sculpt facial appliances this way too. The foam clay is light enough that a little bit of spirit gum can hold small horns directly on your skin.

Unless it's a super small piece, like a domino mask, I prefer to first build a basic head or face form using EVA foam sheets first. This way I can build my sculpt on a sturdy platform. I can lock in the scaling and proportions before ever reaching for a sculpting tool to add details.



The foam clay can be spread right over the surface of your EVA foam. Use a little bit of water to slick the surface of your EVA foam first, which will help the clay stick. Then just add wads of the clay to the area where you want to sculpt. More water can be used to help your fingers manipulate the surface until you've created the base sculpt for that area.



**APPLY WATER**



Once you're happy with the mass of clay you've laid down, it's time to dig into the details. You can use any sculpting tools you would normally use on oil or water based clay, but the feel of foam clay is quite a bit different. There is definitely a knack to using this material effectively and that will only come with practice.

Repeat this process over and over until your sculpture is completed.



*Foam clay can be sanded and sculpted with a rotary tool once it's fully cured if you need to alter your sculpt. I prefer to avoid this kind of alteration, because it chews through that super smooth foam clay surface, leaving a more ragged surface behind. It's not the end of the world, but if you're picky about the final texture of that surface (I usually am), it's worth considering.*



*I know that is an extremely cursory glance at the sculpting process, but sculpture methodology could fill an entire other book that I'm definitely not qualified to write. Fortunately there's a myriad of sculpting tutorials on the internet that should set you on the right path.*



When you're completely satisfied with the sculpt (or I've run out of time and the convention is tomorrow, holy crap when am I going to have time to paint it?? I regret every decision I've ever made in my entire life!) you should leave the clay to dry, at least overnight. This material seems to dry from the outside in. The outer skin dries first, creating that lovely, smooth texture. The parts of the foam furthest from the air, especially if that part of the sculpt is particularly thick, could take days to fully cure. Don't be surprised if part of your sculpt stays kind of squishy for a while.

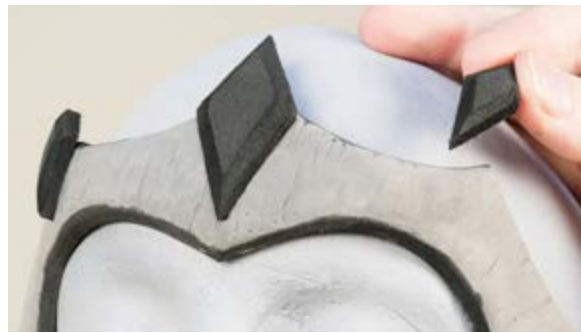


Eventually your artwork will fully dry. Compared to most EVA foam I've used for prop and costume making, cured foam clay seems to be more rigid and fragile. This shouldn't be a problem for something like a mask sculpt, but if you sculpted any thin, free floating details, they could snap whereas a piece of EVA foam would simply bend when flexed.



**DRY AND BRITTLE**

Unless you want to alter the sculpt beyond this point, it's all done. You could start painting immediately or add any additional details on top of the sculpt. If your mask needs to have some more geometric forms added on top of the sculpt, those can be made from more sheets of EVA foam and glued right down to the surface.



### Foam Clay in Push Molds

Another thing that foam clay is great for is push molds. This is especially handy if you've already made a silicone mold and you need the cast parts to be lightweight. You could cast the parts from your molds using a urethane plastic resin, but they will weigh significantly more than a foam version.

It's also a great idea if you're worried about those parts being "convention safe". A jagged, plastic protrusion might get poo pood at the weapon check desk, but the same part made out of a less rigid foam will probably fly.

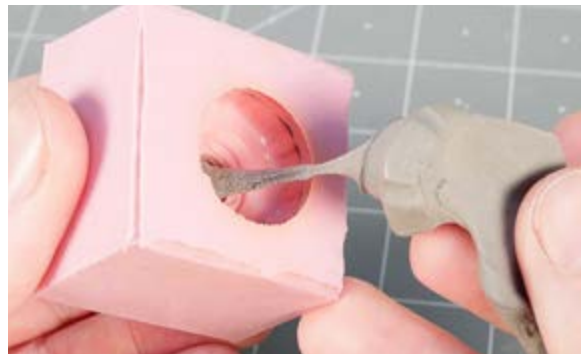


*Comic & Pop Culture conventions have rules about what type of props and weapons are allowed into the venue and what types of materials those props are allowed to be made from. Be sure to read all of the rules pertaining to whichever convention you will be traveling to with your prop and costume creations.*

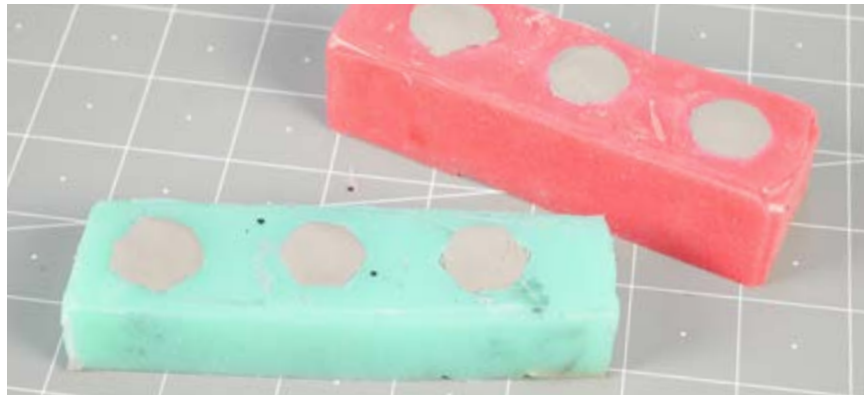
This technique works best with one part molds that aren't too deep. Start by wadding up small hunks of foam clay and stuffing them into the mold. If you can smear the clay all around the fine texture on the surface of your mold, that will help it pick up all of those details. Keep adding small hunks of the clay, blending them together as you work, until the entire mold cavity is full.



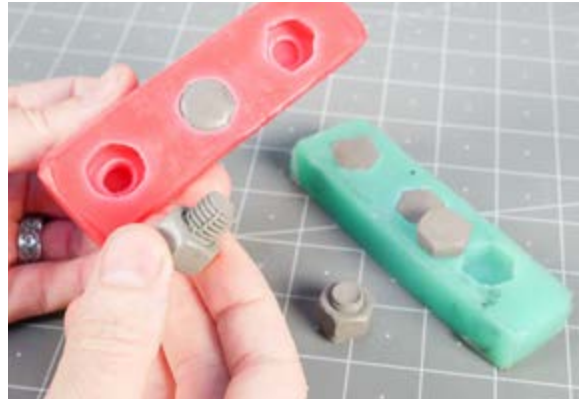
The next step, and I'm not kidding, is to place the foam clay laden mold in the freezer overnight. The reason for this is to make the foam more rigid, so that it can be pulled out of the mold in one piece. Since the foam is air drying, the foam surface that's inside the mold, not exposed to air, won't dry. If you were to try to pull the clay out of the mold the next day, without freezing, the undried foam clay would stretch, distort, and potentially stick to the inside of the mold.



*This is a handy technique, but it is mind numbingly slow, due to the freezing and drying times. If you need to make a bunch of cast parts, it's probably a good idea to make several molds so that you can cast a handful at a time or use a different material.*



The next day you can pull your mold out of the freezer and carefully pull the foam part out of the silicone. You'll notice that the foam does a really great job of picking up the texture from your mold. A huge benefit to this method is that you can get textural detail in the foam surface that would be difficult or impossible with any other EVA foam method. A downside is that now you need to let it defrost and fully dry out. That could take another day or up to a week, depending on thickness.



Something else to be aware of is shrinkage. This material uses some kind of solvent to keep it pliable while you sculpt. As the clay dries, that solvent evaporates and the clay loses a little bit of mass. It may take a week or two for the part to fully finish curing, so you may see your parts change a bit over time.



After a couple days of drying, your cast foam clay pieces can be glued down to your helmet with whatever glue you like; I recommend contact cement or super glue, as usual.



Foam clay literally hit the scene this past year, so I bet we haven't even scratched the surface with what's possible with such a versatile material. If you get your hands on some, I recommend experimenting and seeing what it can do for you and your cosplay masterpieces.

# ADDING TEXTURE

Whether you're sculpting EVA foam with a hot knife and a rotary tool, or you're hand sculpting foam clay, those are great methods for adding texture to the surface of your piece. Another way to add texture is to literally add a material on top of your foam surface. There are a wide range of materials that can be used for this, but I like PVA glue (like Mod Podge or FlexBond).

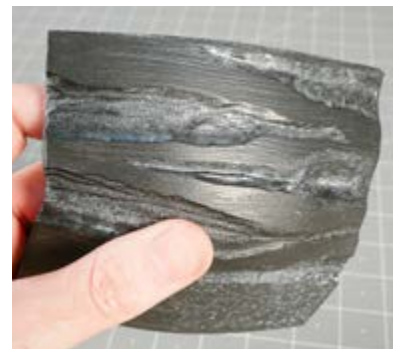
PVA glue is something I commonly use to seal an entire foam creation. If brushed or sprayed on smoothly it can create a wonderfully even surface on top of your foam that helps you create a specific look on your foam costume and props. You can also use it to add a not-so-smooth texture, on purpose.



This is especially useful on more organic looking parts; anywhere that you want a flat, smooth piece of foam to look mottled and irregular. I'll start by brushing on a generous amount of PVA all over the surface and once it's all covered I'll go back over it with a stippling motion. This is the kind of technique that begs for experimentation. Try different types of brushes or anything with a neat texture to add some variety.



PVA by itself doesn't add a lot of relief to the texture, which is kind of nice because you can add that texture in layers that slowly build up to something more dramatic. Definitely let each layer dry completely before adding the next.



PVA is also something that plays well with other materials being mixed into it. Nearly anything (within reason) can be mixed into the glue before adding it to your head gear to give it a unique texture. Something as simple as sand can be used to give your surface a gritty feel. If that surface is too gritty, additional layers can be brushed over it to gradually smooth out the exterior until the texture is exactly what you want.



**PETER, NO!**

Another fantastic material for adding raised texture and detail to your creations is puffy paint. Yes, the same stuff you used to decorate t-shirts at summer camp. Puffy paint adheres well to foam and, when you squeeze out a line of the goo, it stays three dimensional. This is fantastic if you need to draw on some raised detail bits with some amount of control.



There are plenty of other fantastic materials that can be used to add texture to your foam projects. I implore you to experiment with whatever you have available to you and see what kind of results you can get.

# FITTING, VISION, AND COMFORT

Depending on the design of your headgear, the final product may appear to be a finely crafted piece of armored artwork on the outside, but on the inside it might more closely resemble a foam tomb for your head. There are a handful of factors that can have a huge impact on the comfort of your helmet, which is extremely important. If you plan to wear that helmet at a convention all day long, you'll want it to be as comfortable as possible.

## Fitting: Head Fit

You may get lucky and the form of your helmet fits the form of your head perfectly. This depends mostly on the design of the helmet and whether or not it fits snugly to your head. I find that most helmets need some help staying comfortably on my noggin. My favorite material for creating a more snug, comfy fit is upholstery foam.



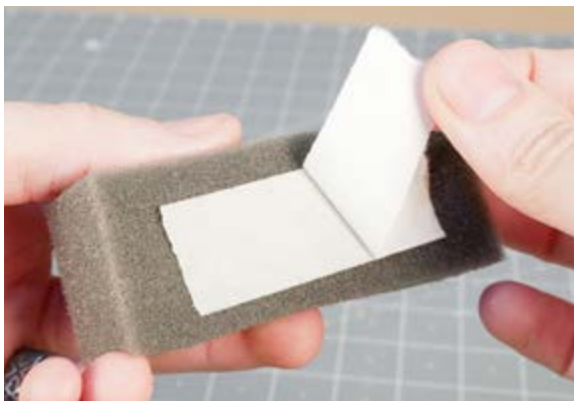
*For a crown or circlet, a piece of foam across your forehead can help the piece stay on your head better as well provide some much needed comfort.*



This squishy, low density foam is fantastic for creating small, soft pads on the inside of your helmet. It comes in a wide range of thicknesses and colors, depending on your needs. It can be cut with a knife or scissors and attached to EVA foam with hot glue. You can cut out several strips of various thicknesses and place them inside the helmet to do some test fits. I usually end up adding a strip along the top of a helmet, one on either side, one on my forehead, and one on the back near where my head and neck meet. The goal is to keep the EVA foam helmet away from your head and only use enough upholstery foam to hold the helmet snug to your head. Too much of that squishy foam could make the helmet too hot to wear.



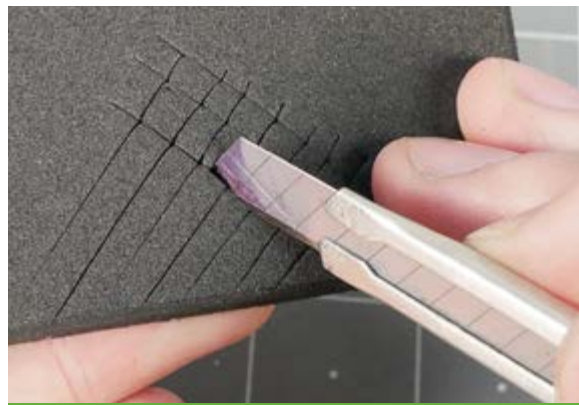
*You can use double sided tape to temporarily hold the squishy foam in your helmet when you're doing test fits.*



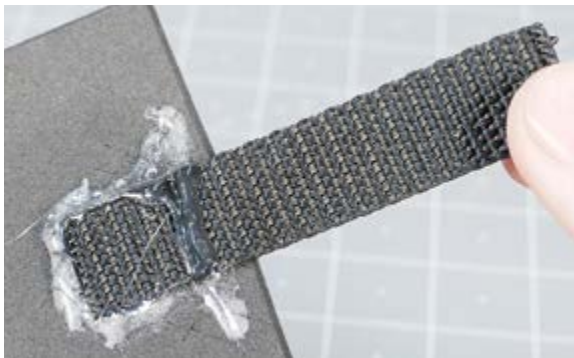
**PEEL AND STICK!**

## Fitting: Straps

Some helmets, and especially masks, will require straps to keep the creation safely on your head. For these kinds of attachments I have two favorite materials; elastic straps and nylon webbing. Both types of straps can be attached to EVA foam using a variety of methods discussed in previous Foamsmith books, but my favorite has to be hot glue. I like to score the inside of the foam with a knife to provide some tooth for the glue and then bathe the area in hot glue. Once it's attached I go over the back of the strap with more hot glue to really lock it down (or to prevent elastic from stretching at the connection point).



**SCORE WITH KNIFE**



Elastic straps are stretchy, on purpose. I use this whenever I need some give and stretch in the fit. This is perfect for things like a mask where the elastic will pull it into your face, providing a snug fit. You can even include a slide so that your mask is both snug and adjustable so that other people with different sized heads can wear the mask.



If you want the strap to be made of something different, like leather, you can attach that leather strap to a short length of elastic that is attached and hidden on the inside of the mask. From the outside it looks like a continuous leather strap, but when you wear the mask, the strap has some give.



## HIDDEN ELASTIC

I use a lot of these strap materials, so I buy a lot of them, all in the same size. That size is usually  $\frac{3}{4}$ " wide. I also buy slides and buckles in that size in bulk (I do the same for 2" wide nylon webbing and buckles, which is great for belts). I always have these materials on hand so that I can quickly create straps with buckles and adjustable slides.



## Comfort: Breathing

You may get to a point where you try on your helmet and realize that there is absolutely no way for air to enter the helmet. Y'know, the air you need to breathe for life (remember what I said about a foam tomb earlier). Hopefully you've already designed a solution before you started your fabrication, but you may find that you need to add some breathing holes.

Some helmet designs are less conducive to adding breathing holes than others, so you may need to get creative.

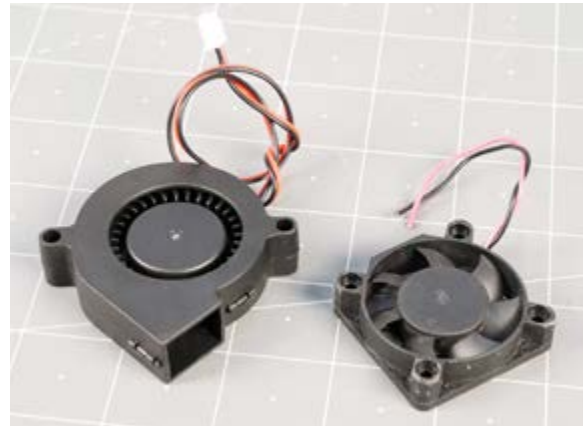
You could just poke holes in and around the mouth area, putting the holes in areas where they will be difficult to notice. Other designs may be more tricky. For example, masks or helmets that are intended to cover your face completely usually don't accomplish the desired look if you can also see your normal human face through a hole in the mask. My favorite solution for this is a black sheer cloth. This is great for blocking mouth and eye holes. From the inside you can still see out of it fairly well and, most importantly, air can pass through the cloth.



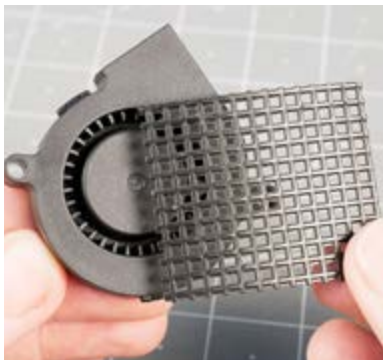
The most important thing to keep in mind is this: when you're wearing this helmet at a convention, if you start to get light headed, take the helmet off *immediately*. Sit down, get some air, and drink some water. Looking super awesome in your helmet won't be nearly as impressive if you pass out in the middle of taking a selfie with Kylo Ren.

## Comfort: Overheating

In addition to the lack of fresh air being a problem for your respiration, it's a problem for your circulation too. Your head is going to get extremely warm inside a foam helmet. Taking a break from wearing your foam head tomb every once in a while is always a good idea. If I'm doing a lot of walking at a convention, I'll travel around with my helmet tucked under my arm with the bonus advantage of extra visibility navigating those pesky escalators. But, If you really want to stay cool, you can always install fans!



Thanks to the wide availability of cheap computer fans, you have an impressive array of size and style options for improving airflow in your helmet. Most of the time a single fan blowing air from outside the helmet onto your face will be enough to keep you cool. Your helmet might even already have a great place where you could poke some holes and install a fan.



Computer fans usually run on either 5v or 12v power supply. You have many power/battery options, but a simple solution would be to buy a 5v USB powered fan and run it off a small cell phone charger.



When it comes to improving airflow in your helmet you can get as fancy as you want. It's worth at least experimenting with the placement of your fan (or fans) for optimal airflow. Just remember that the goal is to bring fresh, cool air in from outside the helmet to replace the stale, hot air on the inside.

*It's worth making sure none of your hair gets sucked into your fans. For most of my full head helmets that require that kind of ventilation, I wear a full head balaclava. This keeps my hair and beard covered and safe from spinning fan blades.*



If your helmet has a transparent visor covering most of the front of it, fogging is going to be an issue. As you exhale your humid breath inside your helmet, that moisture will want to collect inside your visor and fog it up. There are a variety of coatings that motorcycle drivers use which you can wipe inside a visor to prevent this, but I've found that keeping fresh air blowing across the visor will have a much more profound effect.



The very best, albeit slightly complicated solution is to have the air flowing from the top of your head and down across your face. Using more EVA foam (of course) you can make a duct from the rear of the helmet where your fan is located, up the back of the inside of the helmet and up and over your head. The duct can vent at your forehead, facing down and blowing that sweet, chilly air across your face and visor.



Please remember, no matter how good your ventilation or fan system is, it's still recommended you not wear a full head helmet for long periods of time, especially at a convention. It's never a bad idea to take your helmet off every so often, just to cool off.



## Vision

Finally, let's talk about how you're going to see out of your helmet. Again, you might get lucky as per the design of your helmet. Your helmet may not cover your face at all or, at the very least, it might have eye holes already. Some other designs, on the other hand, completely obscure your face and eyes.

There are many different ways to solve this problem, but you may have to get inventive. For example, I don't know what type of space tech Lord Shaxx uses to see through his totally opaque visor, but I don't have access to it. Instead, I cut a small hole in the bit of recessed detail in the middle of the front of his helmet. That hole was backed with black sheer cloth. I can technically see out of that hole, but only with one eye at a time. It isn't perfect, but it works as well as I need it to work and I can simply take the helmet off when I need to walk around and not run into things.

This is an extremely low tech solution, but it is foolproof. It is possible to use a tiny camera and FPV drone goggles to run video directly into your eyeballs, but that can be quite expensive. Also, I've found that the more high tech and complicated the solution, the higher chance that it'll fail when you need it most, especially inside a helmet next to a sweaty face.



**VISION COULD BE WORSE!**

Most importantly, make sure you can see well enough out of your costume that you aren't a safety risk to yourself or anyone around you. The simpler the solution, the better, and don't be afraid to break the 4th wall and remove that helmet if you're having trouble getting around, especially in a crowd.

# ACCESSORIZE!

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Once you've nailed the form, details, and overall aesthetics of your helmet, your attention should naturally turn to only one thing: accessories! What kind of neat features can you jam into your helmet? Here's a collection of exciting features you can add to your headgear.

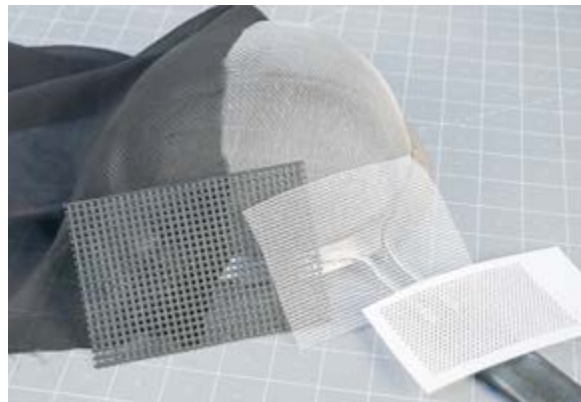
## Glowing Eyes

There are so many amazing fictional characters with glowing eyes in their helmets and masks. Starlord, Iron Man, Bat Man, the list goes on. This presents us cosplayers with a unique challenge. How do we both make the eye sockets of a helmet appear to be glowing, not showing any of our actual human eyes, but also be able to use those human eyes to see through the back of whatever we've used to make the glow?

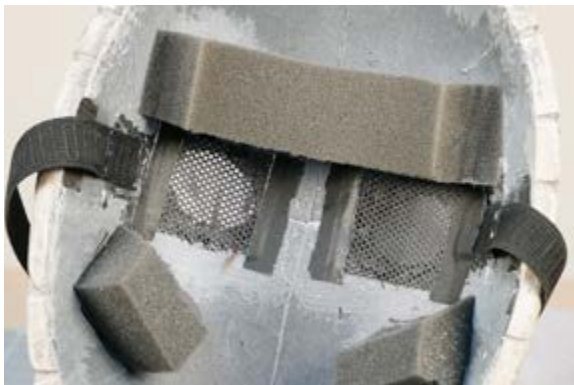
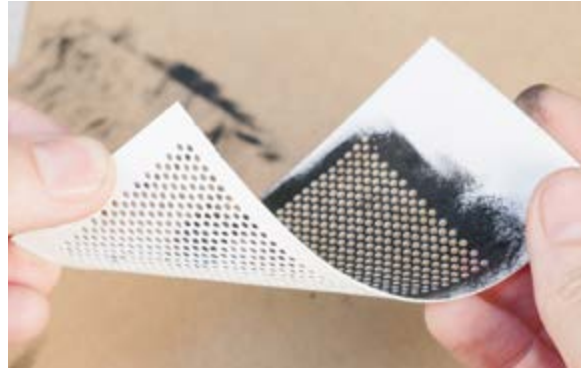


## Mesh

There are several ways to pull off this look, each with their own pros and cons. The first method doesn't actually involve any electronics or lights at all. You can simply cover the eye sockets of your mask with some kind of fine mesh or screen. This mesh can be made from nearly any thin, perforated material or screen. Screen door material works OK, but a thin sheet of metal or plastic with a bunch of tiny holes drilled into it is even more effective.



The key to making this work is the color of the mesh. The outside surface should be painted the color of your character's eye; in this case that is white. The inside of the mesh should be painted black, which will make it much easier to see through from the back.



Obviously, this method doesn't produce a real "glowing" effect, but it is extremely low tech, it obscures your eyes, and you can see OK through it.

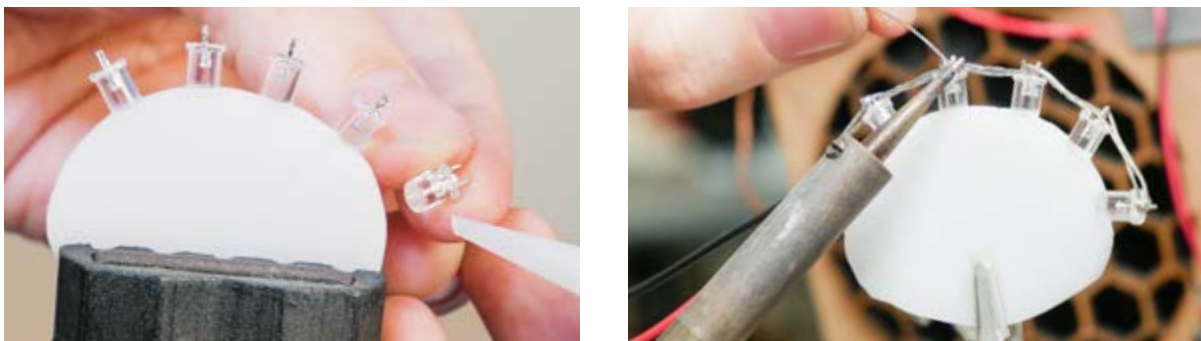


## LED Eyes

To make a real glow, you're going to need to get out that soldering iron and do some electronics. I've covered basic circuits in previous Foamsmith books, so I won't bore you with the specifics here. Let's just jump into an example.

Let's say you're doing an Iron Man helmet. His eyes glow white and are completely solid.

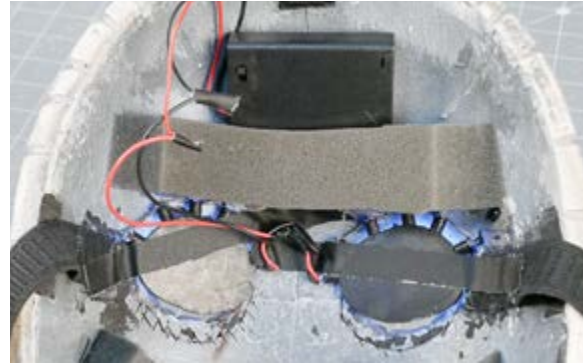
To get a really great glow, I like to use a white, opaque piece of  $\frac{1}{8}$ " thick acrylic plastic, cut to shape and heat formed to fit into the eye socket. Then I'll glue as many LEDs as I can fit along the top edge of this piece of plastic. I usually run LEDs like this in parallel straight to a battery, switch, and resistor (if necessary) that I can hide somewhere in the helmet.



*To keep the LEDs from blinding you, add some kind of tape to the back of your plastic "eye". In this case, I used some aluminum tape.*



This edge lighting will make the entire piece of white acrylic glow super bright. This effect works extremely well in photographs. The trick, of course, is how to see out of this kind of eye covering. The simplest method is to attach the glowing eyes just a little bit high in the socket so that there is a small slit along the bottom of the eye. You can't see a whole lot through this slot, but it should be enough to get your bearings when you're posing in costume. Again, like my Lord Shaxx helmet, its best to remove the entire helmet if you need to walk somewhere.



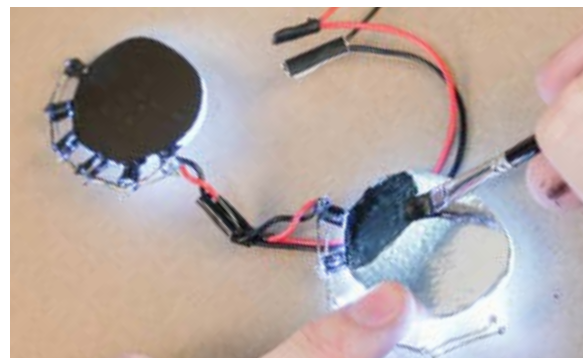
*If you design the eye socket correctly you can make the "vision slit" invisible when viewing straight on, but when you tilt your head down you can get a decent view of the floor in front of yourself.*



**VISION SLIT**



Just like with the mesh you can paint the back of the plastic black so that you aren't being constantly blinded by all of those LEDs.



Another similar method works pretty well for Star-Lord's red glowing eyes. Instead of using an opaque piece of acrylic plastic to cover your eyes, use a completely transparent piece. Then etch a cross hatch pattern into one side of the plastic. If you have access to a laser cutter, this is where it really shines. Otherwise you can use a rotary tool to engrave lines into your plastic.



Then you can glue your LEDs all around the perimeter of this lens. When your LEDs illuminate, they will shine on the lines you carved into the plastic. This creates a semi-glow on your eyes that you can still kind of see through. This isn't as bright a finish as the white Iron Man eyes, but sometimes it's the best solution to get the look you want without compromising your vision too much.



Finally, in some cases, you can fake the placement of your glowing eyes so that your real eyes have full range of vision. This is what we did for our Draugr helmets. Our faces were totally covered by a latex skull mask, so we were able to put a sheer black cloth behind that mask and completely cover our faces and still be able to see out the skull's eye sockets. Then we ran a single LED to each eye. A small, blue acrylic plastic disc was hot glued over the LED, creating that creepy, beady-eyed, undead look. These glowing eyes were glued into the helmet so that they would rest on our eyebrows, just over our real eyes.



This was the perfect solution for these helmets and they're actually some of the easiest helmets to see out of (far better than Lord Shaxx, that's for sure).

**“You can fake  
the placement  
of your glowing  
eyes so that  
your real eyes  
have full range  
of vision.”**



## Moving Parts

Nothing is quite so eye catching on a costume than when you notice part of it moving. Whether it moves on its own or if the wearer moves the piece themselves, it's still always impressive!

One example of a moving part is a visor that can open and close by hand. Not only is this a neat feature to show off, but it's functionally important for getting some breathing air and drinking water. Usually a visor is attached to a helmet via a pair of pivoting joints on either side of your face. The challenge is designing your patterns so that the pivots are in the correct position to allow the visor to open all the way without crashing into the forehead of your helmet. This is when making multiple prototypes early on can be a huge benefit to the end result.



*Instead of making your visor pivot you could make it come off completely using magnets.*

The thickness of your foam will definitely play a role in interfacing between the visor and helmet. You may find that using a thinner sheet of EVA foam for the visor helps the parts clear one another. There are a variety of factors that will come into play to determine the success of your visor's movement. You're just going to have to tinker with it until it works, but believe me, the results are worth it.



**KEEP HYDRATED!**

For your pivots there are a couple of fastener options. For most things, Chicago screws reign supreme. I buy mine at a local leatherworking supplier. They come in a variety of lengths and they're a great way to make non-permanent, pivoting joints. Another option are doll joints. They're kind of like a plastic version of Chicago screws, with a wide range of sizes. I'll pick a screw that has a stem about the length that'll fit through the two pieces of EVA foam. You should be able to screw it tight enough that the friction from the joint holds the visor open or closed, but still allows you to move the visor by hand.



You can do something similar to a full face visor if you have a small visor piece that's supposed to slide down over one eye; a la Boba Fett. Of course, if there's a thin stem holding the visor it'll need to be made from something more rigid than EVA foam, like wood or plastic. That stem can be attached to your helmet with a Chicago screw and the whole thing should be able to pivot down in front of your eye.



The other class of moving parts are those that move all on their own. Unless you know a mystical spell to animate foam, you're going to have to use some electronics; specifically motors. Fortunately, small hobby motors can be had for a song these days and you can run them off something as simple as a pair of AAA batteries.

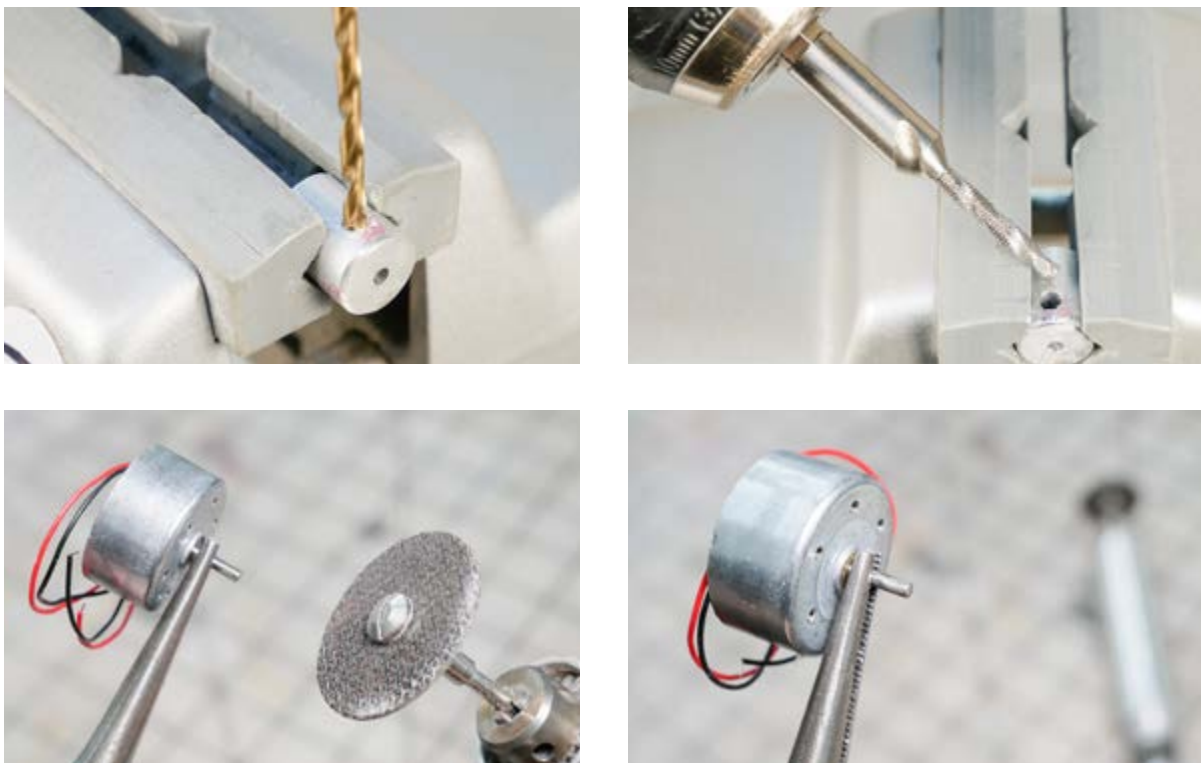


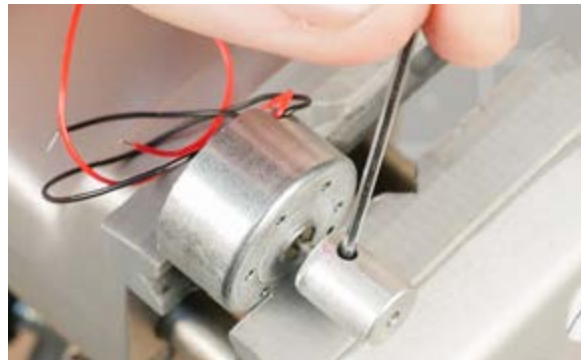
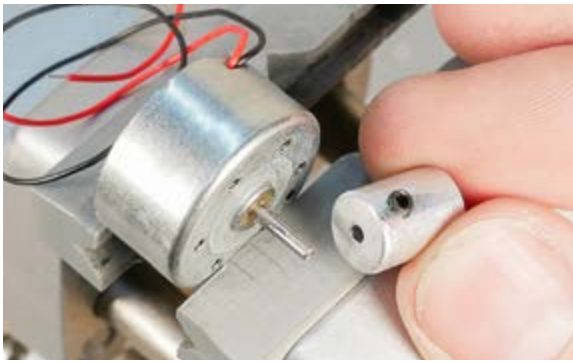
*You'll want a DC motor that'll run off of the voltage of battery you intend to use (motors come in a variety of voltage requirements). Also note the RPM (rotations per minute). A 10,000 RPM motor is going to spin incredibly fast, which you may or may not want to achieve your specific effect. You may need to buy a motor with a "gear reduction" to slow the motor down to a more desirable RPM.*

Once you have your motor hooked up to a battery and switch, all you need to do is attach the motor to your helmet and whatever you want to spin to the shank of the motor. This is usually easier said than done. The motor can be secured to your EVA foam by placing it into a cutout and then locking it in place with hot glue. Be extra careful to keep any hot glue out of the internal, moving parts of the motor.



The other difficult part is attaching your spinning part to the shank of the motor. I recommend using a material that's a bit more rigid than EVA foam, at least for the portion that interfaces with the metal shank. The best material you could use would be some kind of metal, like aluminum, but you could also make wood or plastic work. To secure it to the shank, drill a hole sideways through the piece and tap it with an appropriately sized screw, like a 4-40 or an M3. Then you can place this part over the shank and use a set screw to tighten it, creating a strong, temporary attachment.





*You can put thread locker on the set screw to lock it in place. This will keep it from rattling loose when the motor rotates and you should still be able to unscrew the set screw if you need to.*

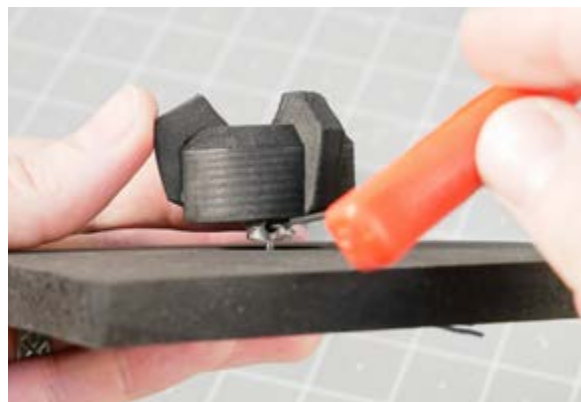


If you don't have a tap set (or if you're using a material other than metal, like plastic or wood), you can attach this piece to the shank with glue. It will not be removable and the bond will probably not be as secure, but it'll get the job done. I recommend sanding the shank to give it some tooth for the glue to cling on to and using something like a 5 minute epoxy.



Whatever method you use, the next step is to glue the costume accessory piece to the attachment piece you made. This accessory can be whatever the design demands. You could use a found object, like an antennae, or something that you foam fabricated from scratch.

*If you used a set screw to attach this piece, the whole thing is removable. This is super handy if you ever need to do any repairs.*





Motors unlock a world of possibilities and you can get amazingly creative. If you're familiar with microcontrollers, like Arduino boards, you can even program your motor to run pre-set patterns of movements. The addition of servos means you can have pieces that rotate in either direction over a precise distance. If you were truly ambitious you could use servos to open and close your visor!

*If you are interested in learning more about Arduino or other microcontrollers, there is a wealth of knowledge available from many sources on the internet. These types of electronics can be used to add movement, lights, and sounds to your prop and costume creations!*

## Smoke

If your helmet design calls for it, smoke effects can be the kind of feature that push your creation into masterpiece mode. This is exactly the kind of effect you can use to create a smoke stack effect, as if part of your costume is powered by fire. You could also make smoke look like something is so cold that you can see the cold air vapor.

The “smoke” I’m talking about here is actually vaporized glycerin, the same fluid used in fog machines to improve roller rinks since the ‘70s. Nowadays the mechanism has been miniaturized for use in e-cigarettes and vape batteries. With some clever engineering, one of these devices can be taken apart and rewired to create the same vapor effect in your costume. It’s also possible to order all of the components yourself to build one from scratch.



*Build and/or modify vape devices at your own risk. They are fairly safe, but they do heat up quite a bit to produce vapor. Also remember that you can only really leave the vapor heating for short periods of time. Many pre-made systems will turn off by themselves after a few seconds to prevent damage to the device.*



**MUST BE A BETTER WAY...**

Also, since our amazing community is so brilliant, several makers have taken it upon themselves to create these contraptions themselves and offer them for sale. I got my own self contained smoke system from Alina over at spoonmakes.com. This takes all of the guesswork out of the electronics and all I have to do is figure out where all of the parts need to fit inside my helmet.

Whatever smoke system you use in your headgear, you'll end up with an output tube that you can direct to the area where you want smoke to come out. This is the kind of thing that takes a lot of experimentation to get the specific look you're after. You can either purchase or make your own additions that will change the shape of the smoke as it exits the tube.

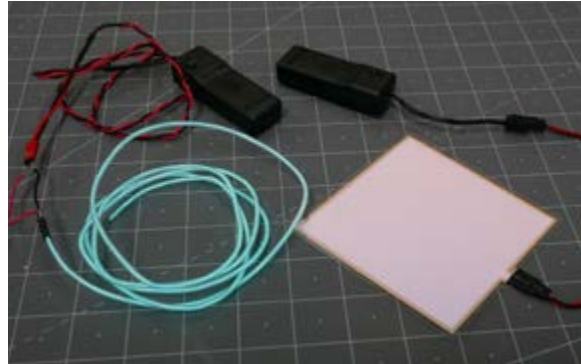


*If the batteries in the modified smoke dispenser are lithium-polymer or lithium-ion, the same as in e-cigarettes, then the current airline rule is that they have to be carried on the plane and aren't allowed in checked luggage.*



## Advanced Lighting

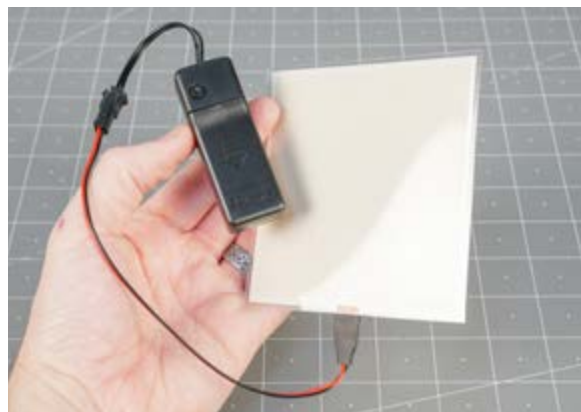
I've covered simple LED lighting circuits in previous Foamsmith books, but I would love to show off some of the more advanced lighting solutions available, specifically electroluminescent (EL) panels and wires. These incredible lighting devices use a material that, when electrified, glows with an extremely consistent light. Compared to LEDs, EL lights create a much more solid glow, but they tend to be much less bright. This makes them a great solution for a specific effect.



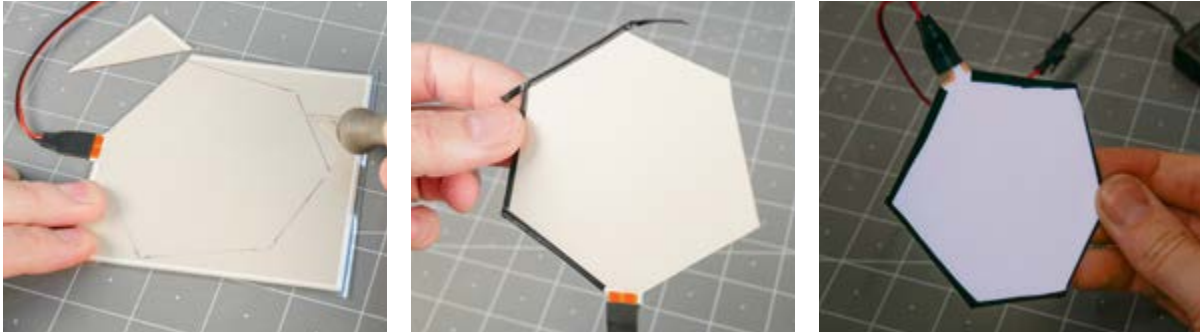
There are two main components for any EL system. The EL wire, strip, or panel, and the power inverter. That inverter is where your batteries are held and is required to step the voltage up to ~100 volts. If you happen to ever touch the exposed leads on your powered up inverter, it will give you an extremely noticeable zap. It isn't enough to knock you out, but it can be quite surprising (ask me how I know), so be careful. These types of inverters also emit a constant, high pitched whining noise. Keep that in mind if you plan to place the inverter inside your helmet. Hearing that tiny hamster scream all day long in your helmet could drive even the most stoic among us into madness.



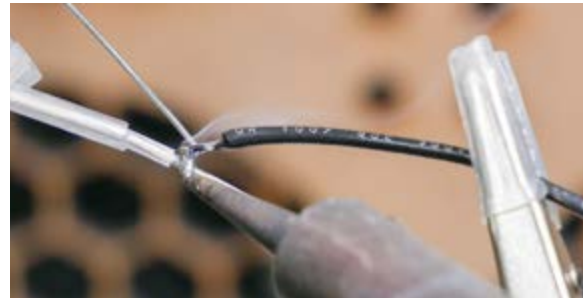
If you don't do anything too complicated, using these devices is as simple as installing the EL component into your helmet in the correct area, connecting that component to the inverter, and turning it on.



EL panels can (usually) be cut to specific shapes. So long as the panel piece stays connected to the power source, it'll light up. Double check the directions that came with your panel to confirm it can be cut, though. The cut edges of the panel should be sealed with something to keep yourself from a potential zap and to keep moisture out of the EL panel.

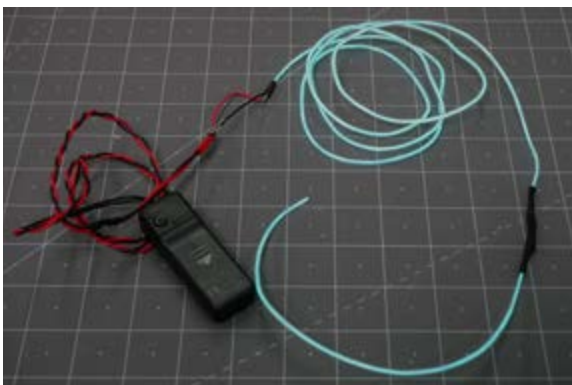


With EL wire it's possible to chain several lengths together to create some incredibly complex patterns. Soldering those chains together, unfortunately, is no trivial task due to the nearly microscopic size of the components. You will need a decent soldering iron with a fine tip, solder, heat shrink tubing, and the wires and connectors for your inverter.

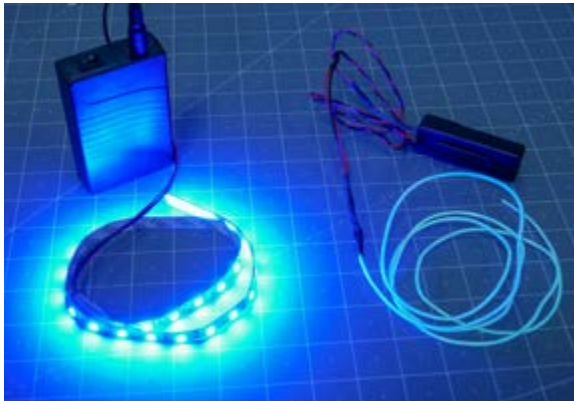


This can be used to connect one EL wire length to your inverter or to connect multiple EL wire segments together in a chain. You can also purchase premade connectors to attach more than one EL component to your inverter.

- Strip Outer Coating
- Strip Inner Coating, Exposing Tiny Wires
- Shave Coating off Phosphorus
- Put Heat Shrink on Leads
- Solder Leads to EL wire (polarity doesn't matter)
- Test Connection
- Shrink Tubing Over Wire



*Remember that EL puts out much less light than LEDs. If your costume is being viewed in direct sunlight, you may not be able to notice that the EL lights are on at all. It does, however, look incredible under dim, indoor light or at night.*



**DARK ROOM**



**OUTDOORS**

When used in the correct situation, EL components can add that special, extra touch to your helmet masterpiece.



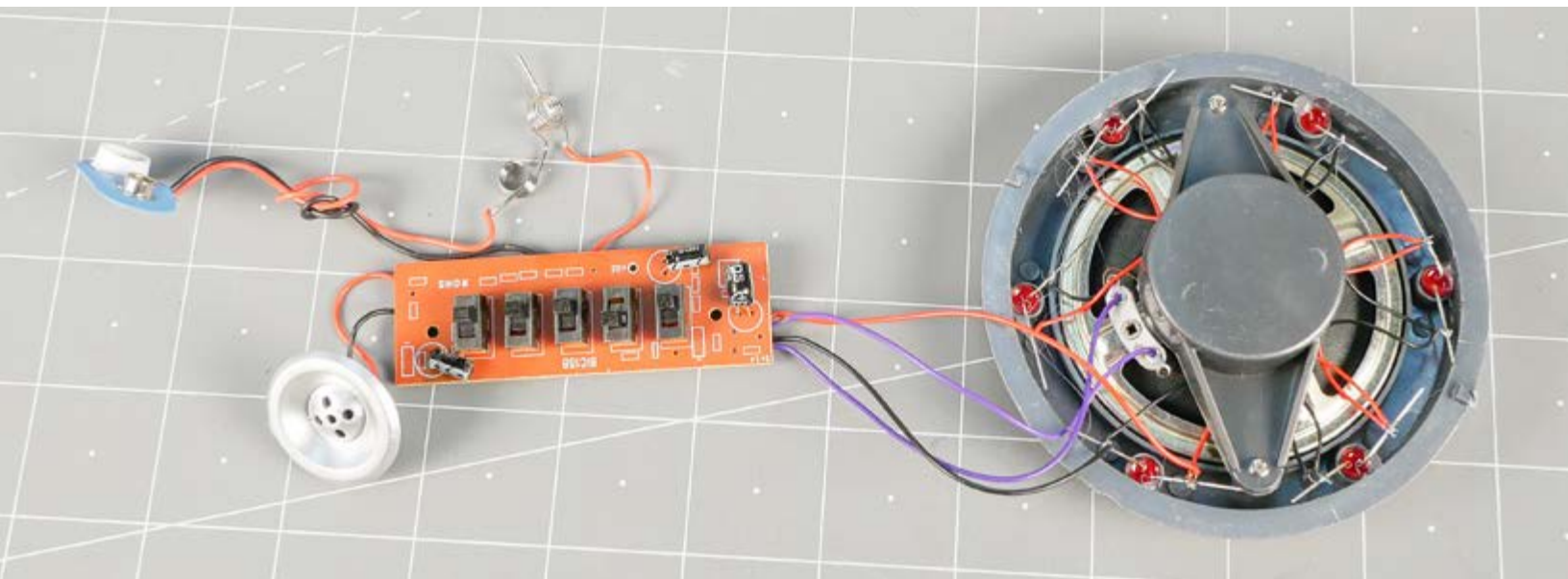
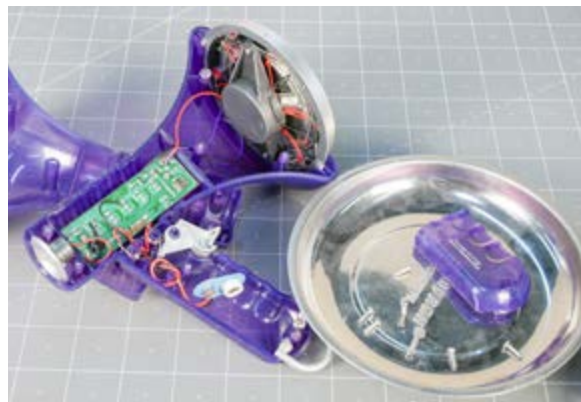
## Voice Changer

If your head adornments will cover your entire face, you have the opportunity to do something extremely cool: disguise your voice. The character you're dressing up as may be an evil overlord, a robot, a fairy princess, or all of the above. Those characters may have a voice much different than yours and if you want to astound people when they see you in costume, changing your voice is an amazing way to do that.

*You may also want to add a voice amplifier to your costume so that it's easier for others to hear you when you're in your full, face covered costume.*



There are many options available for voice changers. One of my favorites is a children's megaphone that has several built in voice options. These inexpensive toys can be taken apart and repurposed inside your costume. You may need to extend the wires for the microphone, batteries, or speaker so that you can place them in a specific place inside your costume and helmet.



You will need to attach the microphone inside the helmet, as close to your mouth as possible. If the wires for your microphone need to run from your helmet to your costume, make sure the microphone isn't permanently attached to prevent damaging it when you take off your helmet. You can even use magnets to hold the microphone in place, but when you take the helmet off, the microphone falls off and dangles harmlessly from your costume.



## MAGNETS!

The rest of the components can go anywhere else in your costume. One of the best places to put your speaker is behind your chest armor, but you should play with the placement to see what sounds best to you.

*There are premade voice amplifiers (some models do voice effects, some don't) that are super popular among Imperial Storm Trooper cosplayers. They're a little more expensive than the toy megaphone, but they don't require any modification. Plus, the higher cost usually means a better speaker with more volume.*



## VOICE AMPLIFIER

# VISORS

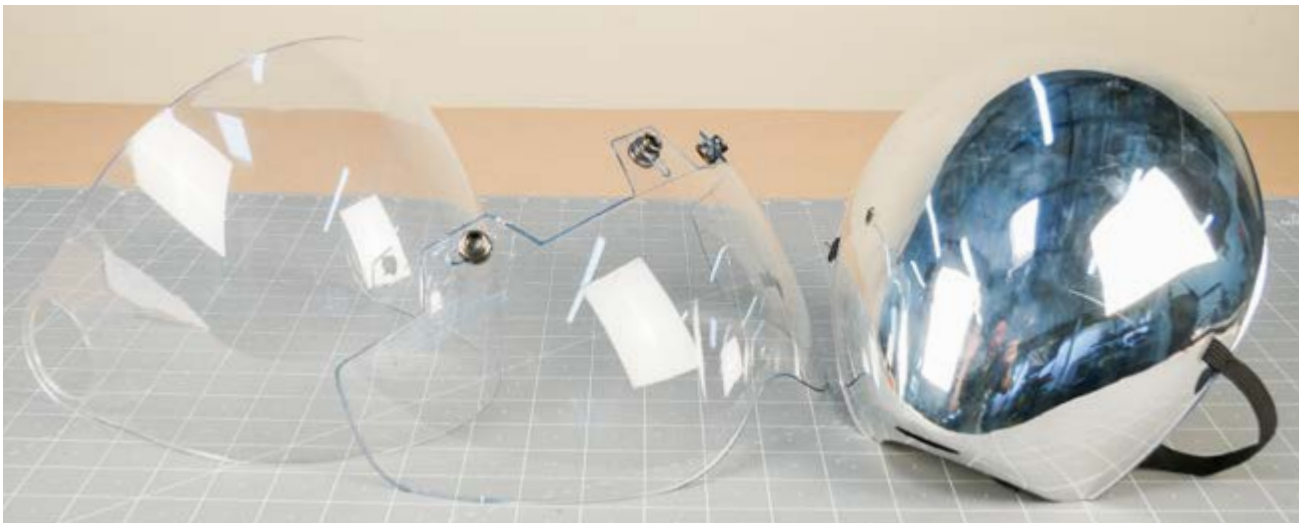
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A custom, see-through visor is the holy grail component of many helmet designs. There's something incredibly special about a visor that's both intricate and custom made, but also transparent enough to see through. There are many options available to us foamsmiths and I have some favorites.

## Store Bought Visors

If the helmet you're replicating has a simple, curved surface, you may be able to use an off the shelf motorcycle visor on your creation. Other great options include skydiving visors, ski goggles, and halloween style masks. Most of these are available in a completely clear, transparent material, but there are many other options like smoke, color tints, and chrome.

*If you're replicating a specific, fictional helmet, you might luck out and find another maker on the internet that sells visors for that particular helmet. It's worth checking websites like Etsy or Ebay on the off chance that someone has already done the work for you.*



You can buy a visor that's a similar form to what you need and just cut away parts of that visor until it fits into your helmet. This is best done extremely early in the build, when you're bulking out your head form before you've started laying out the seam lines. Essentially the pattern gets made around the visor to make sure it will fit. You can test the fit as you build your first prototype foam helmet.





*The visor is usually the last part I attach to the helmet, after most of the painting.*

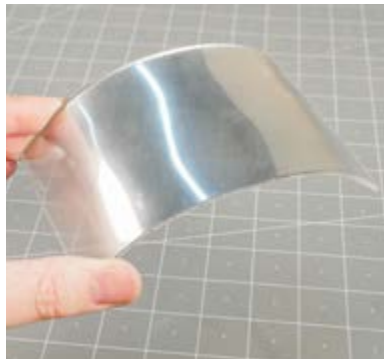
The mirror chrome visor is one of the most challenging types to nail, but fortunately you can just buy one. “No Face” visors can be found online or at Halloween stores, sometimes for less than \$10. They’re cheap and flimsy, but they’re perfectly chrome and you can see through them. So long as the form is close to what you need, this can be a perfect solution for your helmet.



Chrome masks are pretty, but the finish can be fragile. That finish is usually applied to the inside of the mask, so if you’d like to add a protective layer, you can spray in a coat of clear, gloss finish. You’ll definitely want to let that dry for a day or two before you wear it and huff paint fumes.



This same chrome effect can be applied to nearly any other visor. You might have found a store bought visor that’s the correct shape, but it’s totally transparent. To make it perfectly mirrored you can spray a chrome paint on the inside of the visor. My go-to paint for this is Spazz Stix Mirror Chrome, available in a spray paint can, or just the paint for use in an airbrush. I’m sure that there are other brands and types of paint that work, but this one has always worked for me. You only need to spray an extremely thin layer of paint to get the chrome effect. If you’re worried about getting paint on the outside of the visor, you can mask it off. Just like our “No Face” example, it’s worth spraying a clear gloss on the inside after your chrome paint to protect it.



**VISIBILITY**

*Some helmets, like Buzz Lightyear's, are almost entirely visor. It's possible to purchase full or half domes made from acrylic plastic in a variety of sizes. These can get a bit expensive, especially for larger domes, but a premade solution will save you days of struggle.*

### **From Scratch Visors**

If you can't find a similar, ready-made visor that closely matches your design, you're going to have to make one completely from scratch. Depending on a handful of factors, this can be as simple as bending a sheet of plastic or as complex as sculpting and vacuum forming your own three dimensional form.



**HEAT...**

Some helmets have only a thin slit to see through and they can usually be backed with a piece of acrylic plastic (or any transparent plastic) to create the visor. To match the curvature of your face, this piece of plastic can be heated with a heat gun until it's pliable. Then, with gloves on to protect your hands, you can hand form the plastic until the curve matches where it's supposed to fit into your helmet. Then the piece can be hot glued into place.

*To make a smooth, consistent curve, try forming your plastic sheet over something like the side of a five gallon bucket.*



**...AND BEND!**

If you're making a helmet with a unique, complex visor, you're going to need to do some vacuum forming. Nowadays there are several commercially available vacuum forming machines made for hobbyists, like us. If the price is right and the machine is large enough, it's hard to go wrong with a good tool purchase. If the price is too high, or you need something larger, you'll need to build it yourself. There are many fantastic YouTube tutorials on building a machine like this for yourself, but here's a simple example.

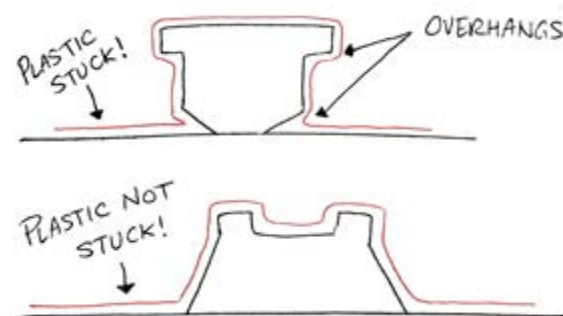
- Buy Toaster Oven
- Build Frame to Hold Plastic
- Build Vacuum Platten Box
- Attach Vacuum
- Heat Plastic
- Press Over Form
- Turn on Suction

*Vacuum forming is equal parts science and art. There is a real knack to getting good pulls from your machine and it will take some time and practice to really nail the process.*

I like to use transparent PETG plastic sheets for vacuum forming visors. I've found that it's one of the easiest materials to use and it's possible to tint it any color. These sheets get cut to size and clamped into a frame that holds the plastic during the heating and forming process. Sheet plastic usually comes with a thin protective film on both sides. I usually remove this film prior to vacuum forming, but some people prefer to leave it on.



The piece that you pull that hot plastic over is known as the pattern, mold, or buck. This pattern should be made from something extremely sturdy and heat resistant, like wood or plaster with a flat side that will rest on the platten of your vacuum forming machine. You also need to be aware of the "draft angle" of your part. It's possible to get your formed plastic piece stuck on the pattern because it wrapped around an overhang on the pattern.

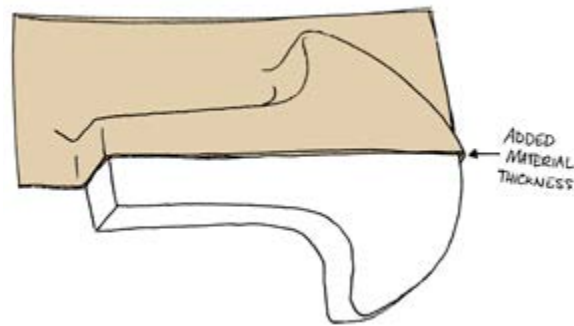


A vacuum forming part usually starts as some kind of sculpt. You could “sculpt” it all out of wood, if that’s your jam. Nowadays you can even 3D print a vacuum forming pattern. This is great if you only need one copy of the visor; the hot plastic usually warps the 3D print after a couple of pulls. You could also sculpt it out of clay, make a mold, and cast a copy of the visor out of a durable plaster like Hydrocal. This is ideal if you need to make several copies of the visor without the pattern deteriorating.

*Remember that your vacuum formed plastic is wrapping over the surface of your pattern. That means the thickness of the plastic is being added to the overall dimensions of your pattern. If that difference in thickness is drastic, it could have an impact on how well the visor fits into your helmet, which is one reason why I recommend tackling the visor before making the foam helmet patterns.*



## PATTERNS, MOLDS, AND BUCKS

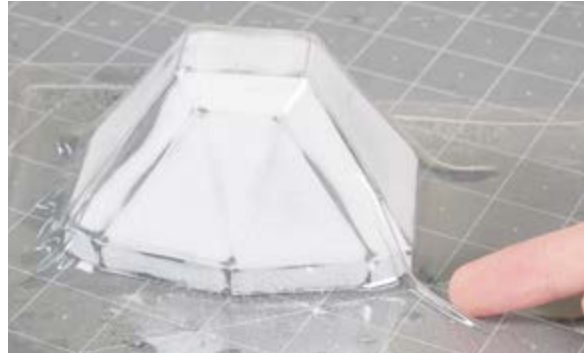


Once you have your machine, your plastic, and your pattern, then it’s time to make your visor. Place the pattern in the center of your vacuum former platten and dust the surface with baby powder. This should help remove the part when it’s done. Turn on the heater to start warming up your sheet of plastic. Once the plastic has softened it will start to sag. It’s ready to pull when the sag is about as deep as your pattern is tall. Then you can move the plastic from the heater over to your platten, pressing the soft plastic down and around your pattern. Once everything is in place, turn on your vacuum cleaner. This will pull the air from below the plastic and, hopefully, form perfectly around your pattern.





*“Spider Webs” are extremely common when vacuum forming. Over time you’ll learn how to best place a specific pattern to minimize these blemishes.*



**SPIDER WEBS**

You can usually turn off the vacuum after 30 seconds or so, or when the plastic has cooled enough to maintain its form. Then you can try and remove your pattern from the formed plastic. Sometimes this is a piece of cake and sometimes it’s a massive pain in the neck. No matter what, do not damage your pattern. Damaging the visor you just pulled is a bummer, but you can always pull another visor. If you break that pattern you will need to repair or remake it.



Your visor will have a lot of extra plastic around the edges that should be mostly removed. I’ve found that a cutoff wheel in my rotary tool is one of the best ways to remove most of the extra material without running the risk of ripping the visor. The remaining rough material can be sanded down nice and smooth using a sanding drum.



*From this point until I tint or install the visor, I prefer to cover it in masking tape to prevent myself from scratching the plastic.*



*If I know I'm going to be tinting a visor, I will leave some of the extra plastic around the edges to hang my visor during the dying process. This can be trimmed off after dying.*

If you need a perfectly clear visor, then you're done. If you need a chrome effect, you can add that mirror chrome paint to the inside of the helmet. If you need the visor to be tinted a specific color, then you're going to need some more supplies. Specifically synthetic fabric dye. The same type of dye that you would use to change the color of synthetic fabrics can be used to change the color of PETG plastic.



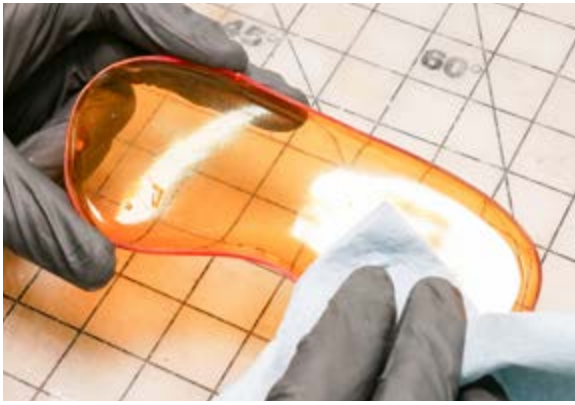
You'll also need a large metal pot (I got mine at a second hand store), a bucket of cold water, a candy thermometer, a stirring tool, and a stove top. Fill the pot with water and heat it up to about 140 degrees Fahrenheit (60C). Try and keep the pot at this temperature for the entire process. If it gets too hot it could warp the form of your visor. Then stir in your fabric dye; two or three packets should do the trick. The synthetic dye may come with several components and they should all be added to the pot.

*Make sure any protective film is removed from the visor surface and that hand oils have been washed away.*

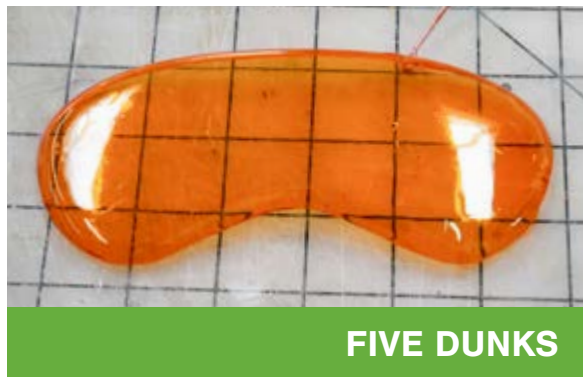


- Dunk your visor into the hot dye bath and leave it suspended for about 5 minutes.
- Pull the visor out of the dye and quench it in a separate bucket of cold water.
- If the color looks correct, you're done. If you'd like the color to be more apparent, dunk the visor for another 5 minutes.
- Repeat this process in 5 minute increments until the visor is the color you want.
- Gently wash off the visor with soap and water.
- Trim away the extra plastic around the edge of your visor.
- Polish the visor with a paper towel and plastic polish.





The tinting process can be a little bit unpredictable. The ratio of dye to water, the color, and the brand of dye can all have an impact on how quickly the plastic absorbs the dye. Fortunately you can dunk your visor in the dye bath as many times as you need to get it to the appropriate color.



Many visor designs are intended to obscure the wearer's face, but also let the wearer see out of the helmet. When trying to replicate this look it can be tempting to dye your visor almost solid black, to ensure nobody can see in to your face, but if you go too dark you won't be able to see out. Fortunately you don't need to dye a visor very dark to hide your face. When the visor is installed in your helmet, so long as there are no light sources inside the helmet, even a light amount of tinting will completely hide your features.



***Tinted visors can also be made reflective with the chrome paint method discussed earlier. Combining these effects produce some stunning results.***

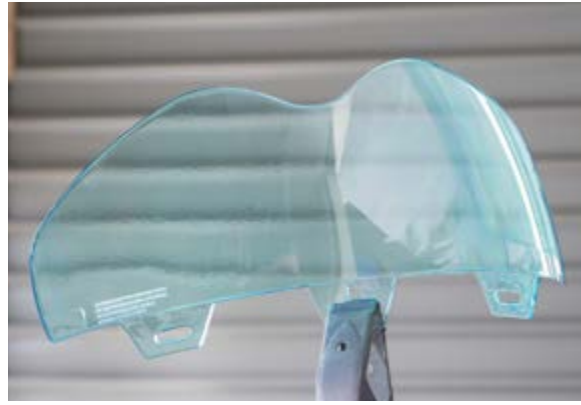
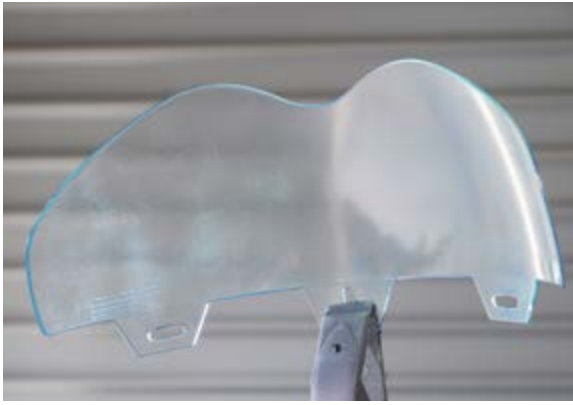


Dyeing a visor with synthetic fabric dye provides a great look, but it can be messy and it really only works well with PETG. If you're working with a factory made visor or you made your own from something other than PETG, then there is another great method for tinting your visor. It turns out that rattle can "stained glass" spray paints are pretty great at adding a color to something transparent without making it opaque.



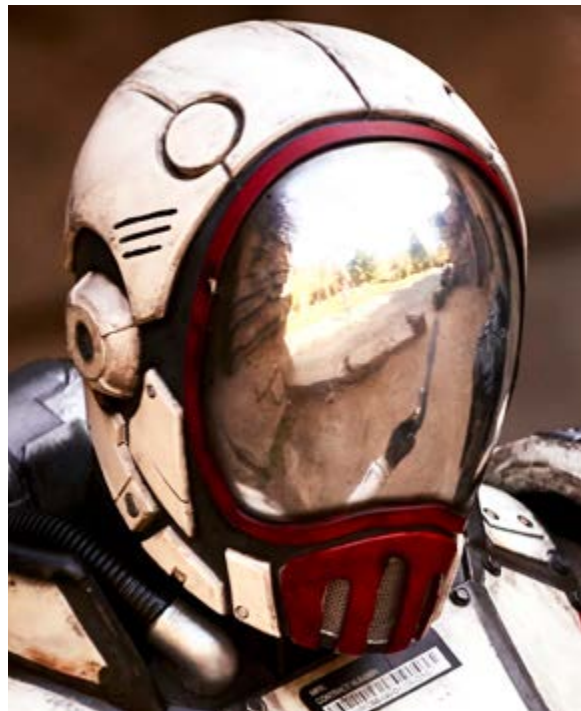
I picked up a can at my local craft store and it did a great job of giving a blue tint to my off-the-shelf visor, just by following the instructions on the back of the can. The color is pretty faint, so I had to use five layers, but that gives you a lot of control over the specific shade you're going for. Each layer goes on a little cloudy, but quickly dries and becomes extremely transparent.





*The only real downside to these “stained glass” spray paints is the limited selection of colors. Our local store only had blue, red, and green but more colors are available online.*

Like I said earlier, this type of work is both a science and an art and it can be difficult to get the knack right away. The more you practice the better you’ll get and the more your visor will turn out looking exactly the way you wanted. It can be a challenging journey, but if you become a visor making master, you can make some ridiculously amazing, intricate helmets.



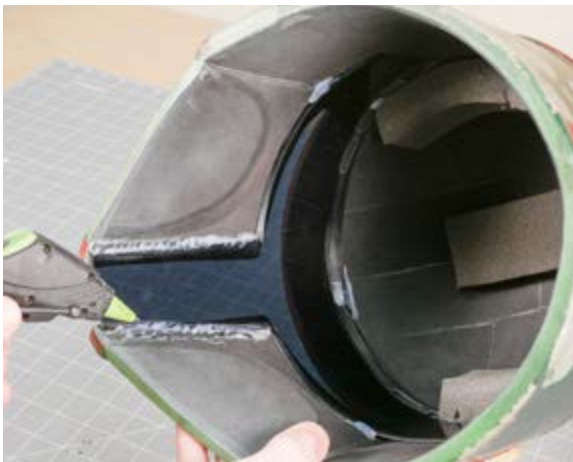
Evil Ted Smith  
eviltedsmith.com

## Installing Your Visor

Each visor is going to have its own design elements that will dictate how it can be attached to your helmet. No matter the arrangement, I usually use hot glue to secure my plastic to the foam helmet. It's easy to apply and if you need to remove the visor it can be reheated or trimmed away.



*You don't necessarily need to hot glue the entire perimeter of the visor. Just tacking it down in a few key spots should be enough to hold it in place and, if you need to remove the visor for any reason, it should be much easier to take out.*



If I can, I'll wait to glue the visor in place until after I've painted my helmet, but that isn't always possible. Sometimes there are elements of your helmet that need to overlap the visor after it's been installed. In this case, you can install the visor when it makes sense during the fabrication process and, when it comes time to seal and paint your foam, you can mask off the visor to keep it clean.



Adding a transparent visor to your helmet instantly gives it a more manufactured look that's hard to beat. I highly recommend challenging yourself to add something like this to an upcoming costume build, you will be blown away by the results.

That was the very last bit of instruction. The next part of the book covers several example builds from start to finish so you can apply what you've learned!

# Part 2

## Basic Crown



Difficulty: 1/5

Foam Used: TNT Cosplay Supply

10mm: 1 Sheet

4mm: 1 Sheet

2mm: 1 Sheet

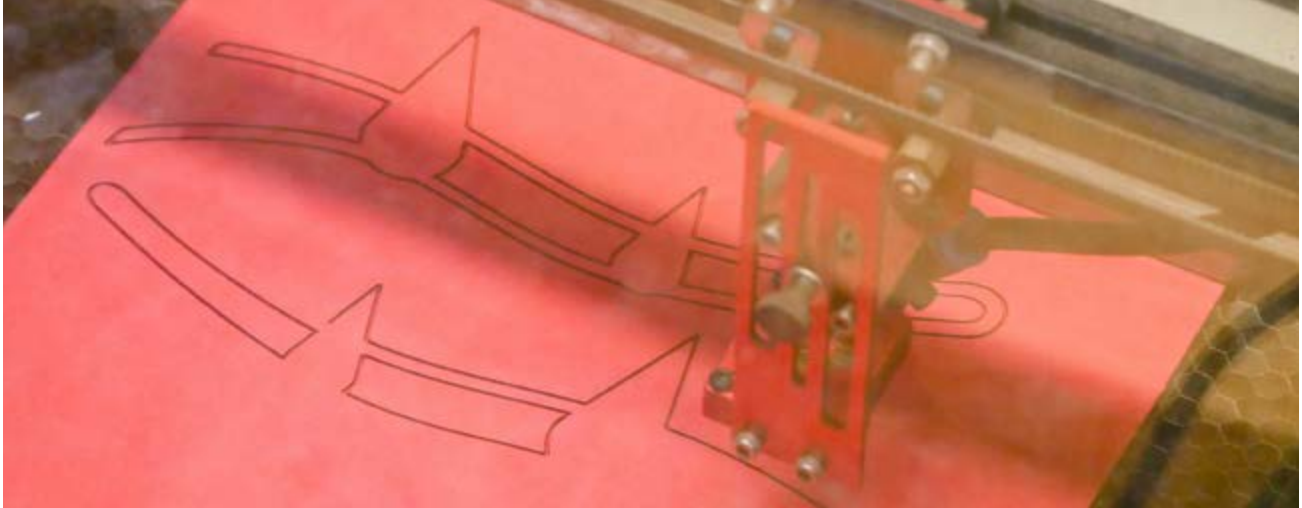
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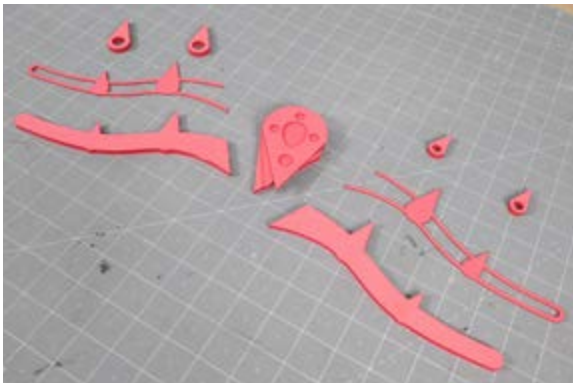
This crown is an excellent beginner project!



If you want to make a bunch of these crowns quickly, find EVA foam that's already a desirable color (craft stores sell all kinds of colors of 6mm and 2mm foam). Cut them out, glue them together, add some gems and an elastic strap and BAM!... You've got a crown! Bonus efficiency points if you cut out the pieces with a laser.



**LASER CUTTER**

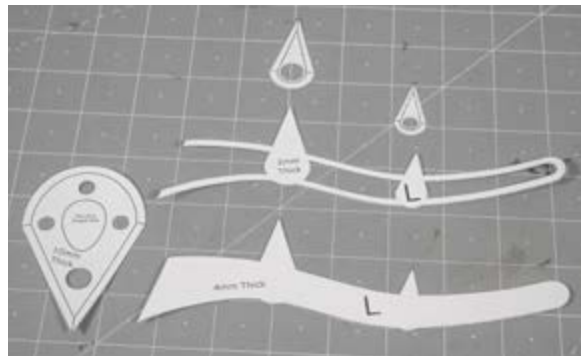


# BASIC CROWN BUILD

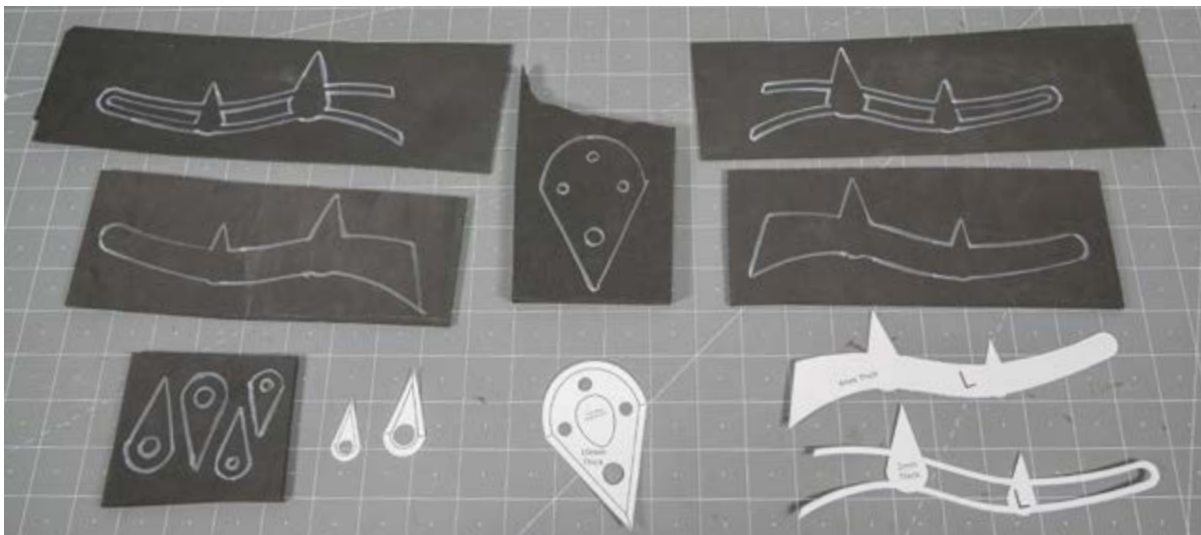
The pattern for this build is a single page and it's designed to work with some gems I bought at a local craft store. You can choose to omit some or all of the gems, or replace them with whatever you have on hand.

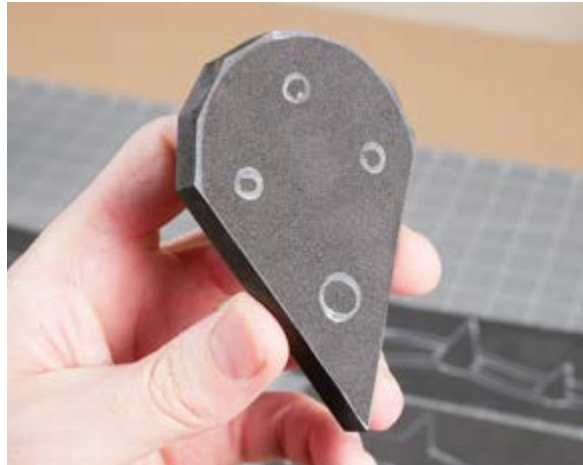


I started by cutting out my pattern. There's one center piece and the rest of the parts are used for both the left and right sides.



All of my pattern pieces were traced onto their respective thicknesses of foam. I started by cutting out the four small spikes from 4mm foam and the large center spike from 10mm foam. I left a little bit of material along the round edge because I didn't think I could cut a clean edge by hand.





Instead I used my rotary tool to sand away the remaining material and sneak up on the line. A disc sander is another excellent tool for this work, but be gentle! That machine will consume foam the same way Cookie Monster eats Oreos; without hesitation or regret.

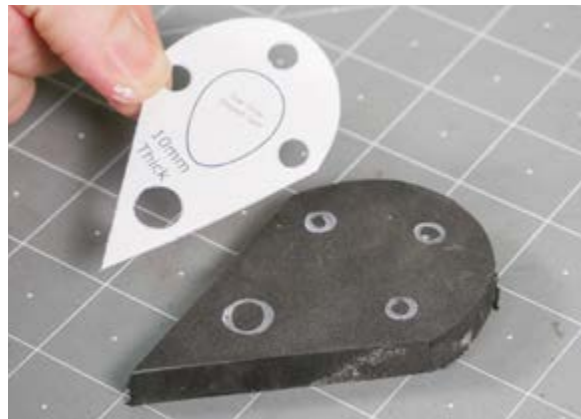


**DISC SANDER**

The thinner 2mm foam pieces were cut out with a craft knife. This completed the first bit of fabrication and I moved on to some of the finer details.



I started by trimming the borders off of my spike pattern pieces. These borders indicate where a bevel should be added. By trimming them off the patterns, I can trace this new edge onto those parts.



Once I had them laid out, I used the rotary tool to put a chamfer around all of my spike parts.



The holes for my gems were made using a sharpened metal pipe. I have a handful of these pipes in a variety of diameters for this very purpose. I use my rotary tool to sharpen the pipe and then I can punch a hole right through the foam. I rescued the little punched out foam bits, cut them in half, then glued them back into their original spots, a little bit recessed into the surface. A couple drops of super glue held them in place.





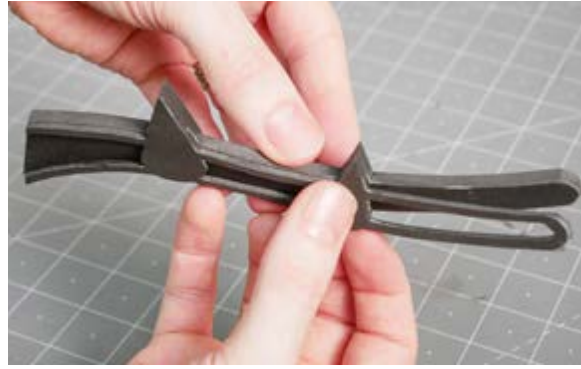
**REMOVE EXTRA GLUE**

I repeated this everywhere I planned to add a gem. The holes should be just large enough to easily hold whichever gems you chose.



With my holes squared away, I turned my attention to assembly. I started by gluing the 2mm detail parts to the sides of my crown with contact cement. I tried my best to get the two layers to line up as close as possible, but they didn't need to be perfect.





*If you accidentally brush contact cement on the wrong side of a piece of foam, you can use a thinner to carefully wipe it clean. Definitely wear gloves and work in a well ventilated area.*



Up next were the smaller spikes, which were also glued down with contact cement.



**LAYERS**

With my sides assembled I used my rotary tool to clean up the edges. I also gave the edges a gentle round over. This blended the 2mm piece with the 4mm piece, making them look like they were made from the same piece of material.



With the side pieces built I could glue them to the main center piece. I used more contact cement and stuck both sides on the crown.





That was the last bit of foam fabrication. I held the crown up to a head form to test the fit. With the foam bent around the head it transforms our flat creation into a head worthy masterpiece!



To get my crown to maintain that shape, I used some metal wire. I had some aluminum armature wire for mine, but something like a hanger wire would work too, it's just more difficult to work with. I cut a piece of wire that reached the length of my crown. Using a pair of pliers I bent the ends over themselves. This keeps the sharp cut ends of the wire from poking through the foam.



**ARMATURE WIRE**



Next I hand formed my wire into a shape that fit onto the profile of my crown. I traced around the wire onto the back of the foam to get an outline for scooping out a trench. Then I used my rotary tool with a sanding bit to dig a slot that would fit my piece of wire.



To cover my wire I cut a couple pieces of 2mm thick foam. I brushed contact cement on the back of the crown and those 2mm strips. I let the glue dry for 5 minutes then I pressed the wire into the trench and covered it all up with the foam strips.



With the wire embedded in the crown I could then hand shape it to fit perfectly onto my head.



**BEND WIRE**



**IT FITS!**

To help with my finishing work, I stuck a wooden skewer into the back of the crown (I later added hot glue to keep it from falling off). I used my heat gun to heat seal all of the foam.



There are countless ways you could seal and paint this crown. In fact, at this point you could grab a brush and just go bonkers, but I had something a little more fancy in mind for this crown. I decided to seal mine using an epoxy so that I could sand the finish until it was nice and smooth.



This Epsilon Pro epoxy is made for sealing foam. It's a two-part epoxy that I mixed in a small batch. I also poured the batch into a wide, shallow container to keep it from curing too quickly.



Using a disposable acid brush, I covered the entire surface in my epoxy. I made sure to get the goo into every nook and cranny. I also tried to keep the epoxy from pooling in low areas like the gem holes.



I let the epoxy cure fully overnight. Despite my best efforts to brush on a nice, even layer, I still had some drips that needed to be dealt with. I started by sanding the epoxy nice and smooth with some 200 grit sandpaper and a nail file, removing the drips.



*Epoxy is great for coating your foam in a durable, sandable finish, but it is possible to accidentally sand through the epoxy down to the foam below.*



**SANDED THROUGH FINISH**

Since I'm a glutton for punishment, I decided to brush on a second layer of epoxy.



**SECOND LAYER**

Once that was fully cured, I sanded every surface smooth again, this time using a 400 grit sandpaper until I was totally happy with the surface. Then I primed my crown to prepare it for paint.



# PAINING THE CROWN

The first layer of paint was a gloss black. I used one of my favorite airbrush acrylic paints (Createx), paying special attention to the technical instructions on the bottle. Using my airbrush, I sprayed on a gentle dust coat of black paint. This layer only barely covered the surface.



I let that dry for about ten minutes and then I sprayed on a second coat of the black paint, this time much heavier. This would be considered a “wet” coat. The goal was to cover everything with just enough paint to make it all nice and shiny, but not so much that it starts sagging. I definitely gave this overnight to dry.



Once my shiny black paint was dry, I could focus on getting a legit metallic finish. For this, I turned to my old friend graphite. You can buy graphite powder online, but you can also just grind up pencil graphite with sandpaper. I find that 400 grit works pretty well!



**GRAPHITE POWDER**

I used a cotton ball to pick up some of the graphite powder and started massaging it into the black paint. The graphite stuck to the black paint and created a super shiny metallic finish. I brushed graphite powder all over the crown and then buffed it until it shined.



While this is a seriously shiny metallic finish, it is fairly delicate. It's possible to rub the graphite off over time. You can decide to be OK with that and reapply the graphite every once in a while, or you can clear coat the graphite to protect it. For this project, I decided to protect it with a clear coat. Most clear paints will dull a metallic finish like this, but Aqua Gloss from Alclad does a pretty good job.



*Aqua Gloss dries totally clear, but when it's still wet it might look a little bit milky with a slight blue tint, so don't freak out when your prop looks blue all of a sudden.*



Once my clear coat dried I was excited to add the finishing touches. For the recessed areas on the sides of my crown, I added some texture using Mod Podge. I stippled several layers on the crown, using the brush to create a texture that would visually separate this part from the smoother parts.





These textured, recessed areas then got a little bit of color. Blue is my favorite color, so I mixed up a dark blue with a hint of red and black. The dark blue was used to fill in the entirety of those recessed areas. Once that dried I use a lighter blue to highlight just the middle of those shapes. Then I used a silver to add a slight highlight in the very middle, creating a little bit of a gradient from silver to dark blue.

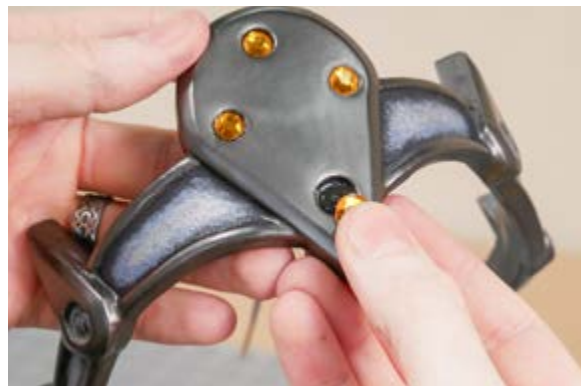




Finally it was time to add my sparkly gems! I really enjoy the color contrast between blue and orange, so I picked some amber gems from my collection. I found that the epoxy had filled in my gem holes a little more than I wanted, so I used my rotary tool to make some more room.



After that, a touch of super glue was all it took to secure my gems in the face of my crown. Oh also, I ripped the skewer off the back of the crown so that it could actually be worn.



**SPARKLIES!**



If the inside of your crown is uncomfortable against your skin, glue some raw 2mm foam to the inside of the crown. The raw foam is much more soft and comfy!



# Part 3

## Dwarven Helmet

Difficulty: 3/5

Foam Used: Yaya Han Cosplay  
Foam

10mm: 1 Sheet

5mm: 1 Sheet

2mm: 1 Sheet

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[www.punishedprops.com/foamsmith3](http://www.punishedprops.com/foamsmith3)

Our Dwarven helmet was designed by my friend Benjamin Barnard ([ben\\_barnard.artstation.com](http://ben_barnard.artstation.com)). I asked him to come up with something that reminded him of the Dwarves from the Lord of the Rings films and he knocked it out of the park!

The features of the helmet are mostly geometric, making this a fairly straight forward build. If you're ready to jump in and make your first full-head helmet, this is a fantastic first project.

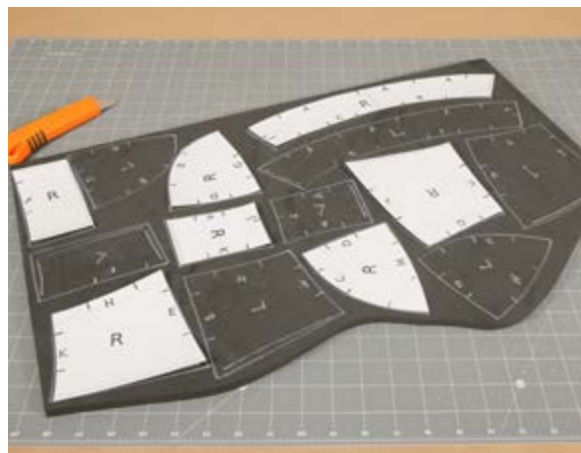


# DWARVEN HELMET BUILD

I printed out the patterns for my dwarven helmet on card stock and cut them all out with a hobby knife, making sure to cut out my registration marks. I started the build with only the 10mm thick, base form parts of the helmet. These were traced onto my 10mm foam, flipping each pattern piece over to trace both the right and left side parts.



*Each pattern piece lists what thickness of foam it should be made from. It's not important that you have the exact same thickness of foam for your build, but it is important to use a variety of thicknesses to get a similar looking outcome.*



All of these parts could have been cut out with a sharp hobby knife, but I prefer to use the band saw whenever possible to justify my impulsive tool buying habits. It also makes super clean cuts, quickly.



**HAND CUT, OR...**

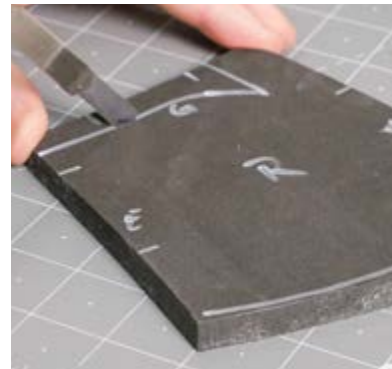
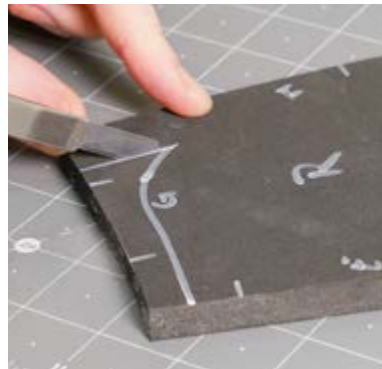


**BAND SAW!**

Three of the side panels of our helmet have a trench running along the top edge. On the pattern, this trench is marked with a dotted line that can be removed and re-traced onto these side foam panels.



Then I scored the foam along that traced line, cutting about half way through the total 10mm depth. I then cut along the side edge of the panel, perpendicular to the cuts I just made. The blade went deep enough to connect the two cuts so that I could remove the shape to form my trench.



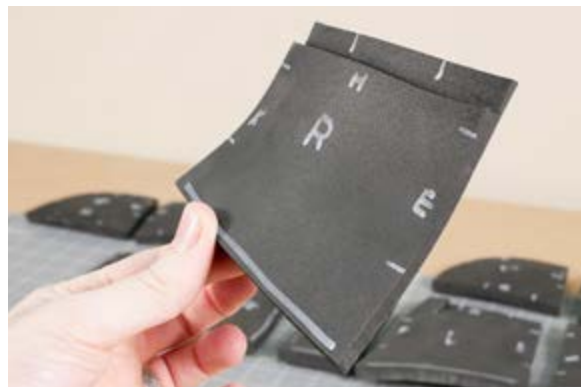


I repeated this on all three panel pieces for the other side of the helmet.

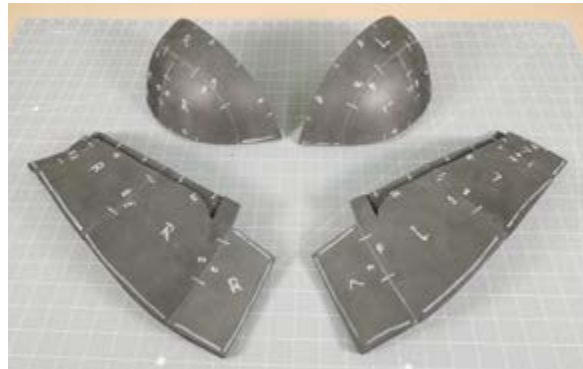


**REPEAT**

Before gluing all of these base pieces together I did a little bit of heat forming. I used my heat gun to warm up the foam and then I used a “foam anvil” (any rigid, rounded form should work, like the back of a ladle) to help these flat pieces get a little closer to the complex curves I need them to be. Some of the parts were formed by hand to get the curve I wanted.



Next it was time to glue all of these base form pieces together. I used contact cement for every seam and I worked in batches, creating smaller subassemblies first before combining some of the larger parts. I also like to build each side of the helmet separately and only attach the two halves once each is complete.



The top dome parts were connected carefully to the seam along the trench I cut out earlier. This was a little bit tricky, but I made sure to take my time.



The last seam was the one going right down the middle of the helmet. I pressed it together carefully, working on a small section of the seam at a time until I had a solid base form. I placed it on my head form and used my heat gun to warm up the foam and hand form it a little closer to the shape I wanted.



**HEAT FORM**



*If the face guard won't stay together, a little bit of duct tape from the back can hold it in place while you work on the rest of the helmet.*



Before adding more details to the helmet I used a 200 grit sanding drum in my rotary tool to round over most of the exposed, sharp edges. This is generally a more pleasing finish on most foam projects and it can be easier to reach those edges before you've added more details.



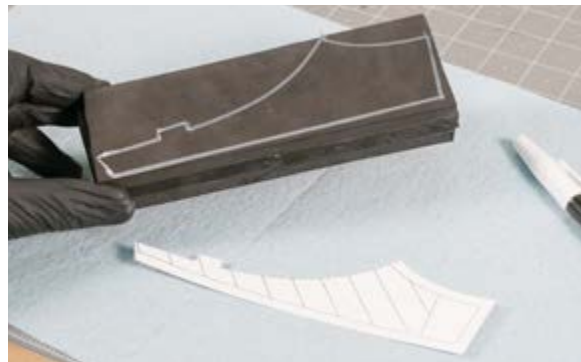
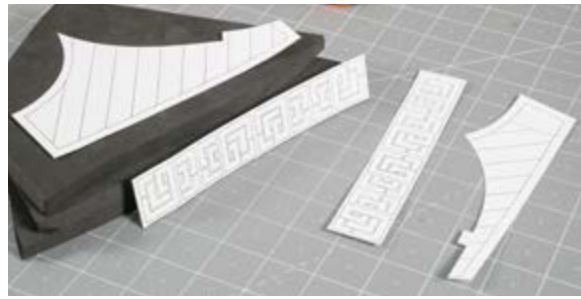
I also used that same tool to clean up any of the seams that I wasn't able to line up perfectly. Anywhere that had a little bit of an inconsistent edge got sanded nice and smooth.



After sanding with the rotary tool, I smoothed the area out even more with some homemade sanding sticks. I did one pass with 200 grit and another with 400 grit. This won't make the surface shiny smooth, but it will remove some of the "fuzzy" texture you get with foam, which will be helpful when sealing.



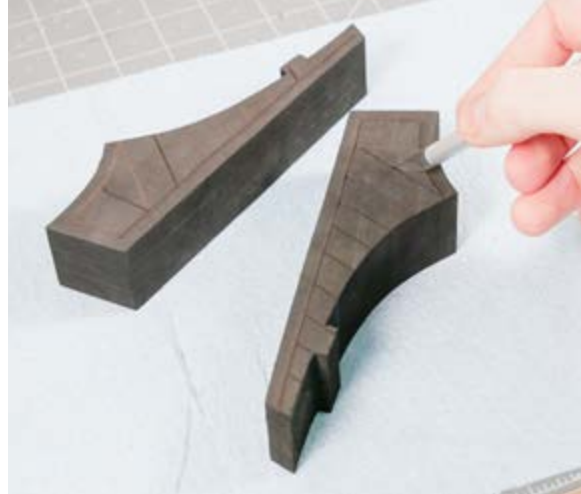
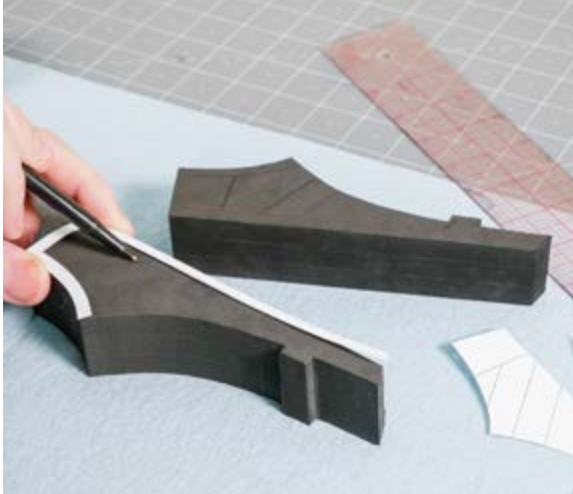
With the base form of the helmet completed, it was time to add some fun details, starting with the horns. There is one front horn and two identical side horns. To create these relatively thick pieces, I started by gluing three pieces of 10mm foam together to create a ~30mm thick sandwich from which to cut my piece.



This example is one of the side horns and it has a small protrusion where that horn overlaps the trench we cut into the helmet. These thicker parts can technically be cut with a knife, but to get a really clean result, a band saw is hard to beat.



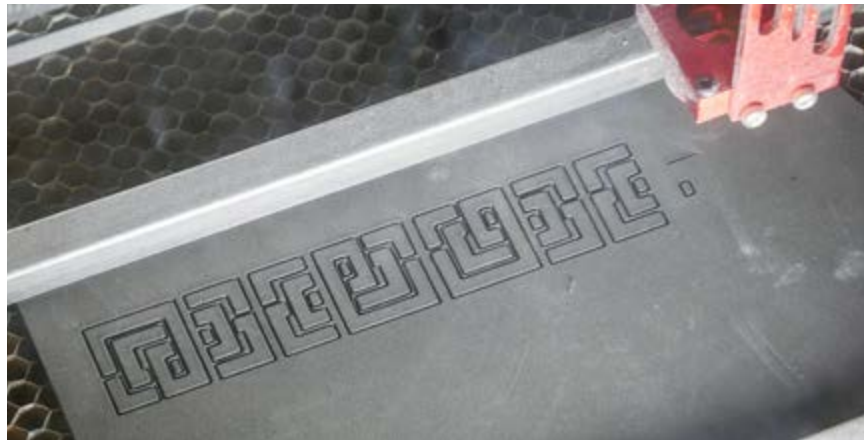
The finer detail lines on the horns were then transcribed onto these cut out shapes with a pen. With a sharp knife I scored the foam along each of these lines. Then I used a heat gun to open up those lines and create the fine details. This is a technique I use on nearly every foam build and it's still always a pleasure to watch the lines open up.



*Be careful not to overheat your glued seams. Fresh contact cement will start to separate if it gets too hot.*

The knot pattern on the face of each horn is incredibly intricate. I could have used the same heat gun method, carefully scoring all of those lines, but this was also a perfect excuse to use my laser cutter (saving time and a portion of my sanity). Using an extremely low power setting on my 45w laser, I etched the lines into a piece of 2mm foam.





These thin detail parts were cut to rough size, then glued to the faces of each of my three horns. The edge of the 2mm foam was proud of the horns in some places, so I used my rotary tool to round over all of those edges, creating a seamless appearance.



The front horn covers the pointed brow of the helmet, so I cut a “V” shape out of the back of the horn so that it would fit together perfectly.



To attach the horns, I held them each in their respective places on the helmet and traced around their bases so that I knew where to add my contact cement. Then I glued up both the back of the front horn and the helmet, let it all dry for 5 minutes, then stuck them together.

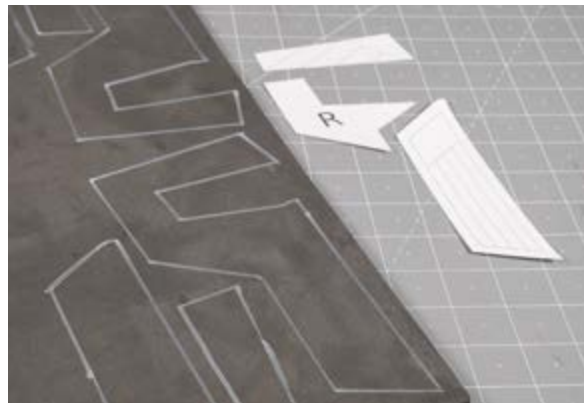
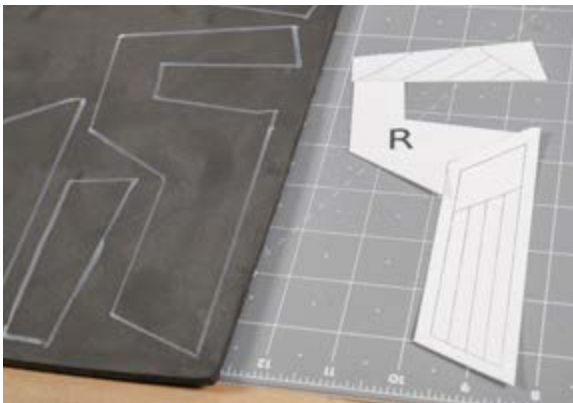


*I did the same thing for the side horns.*





The face mask of this helmet was made from several layers of foam, each roughly 5mm thick. The first layer was the entirety of the face mask. This is the bottom layer. Once that was traced out I cut the pattern into smaller pieces to trace out the additional two layers.

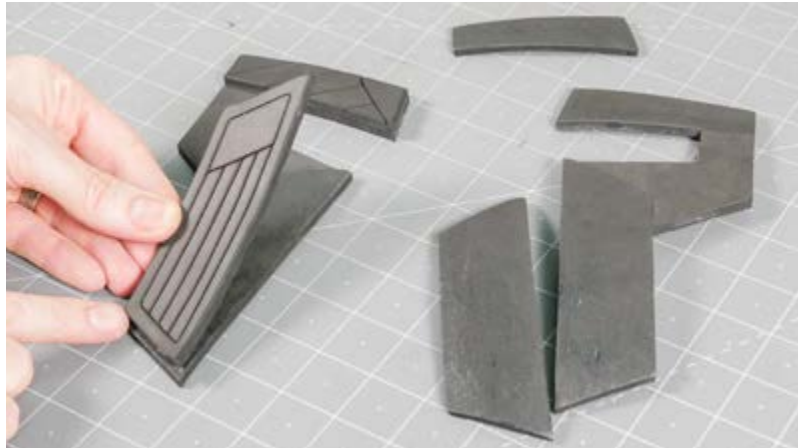


Before gluing them all together, I transferred all of the surface details to the foam with a pen and did our neat score and heat trick.

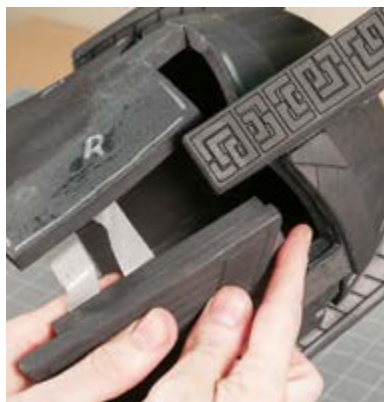




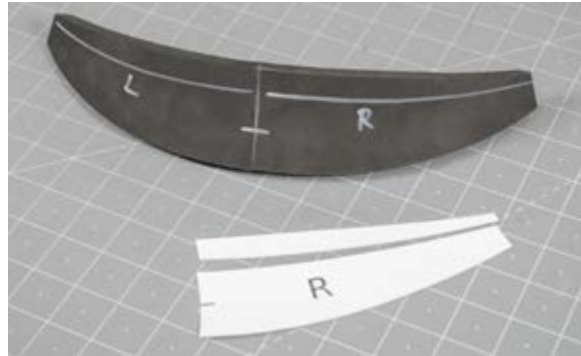
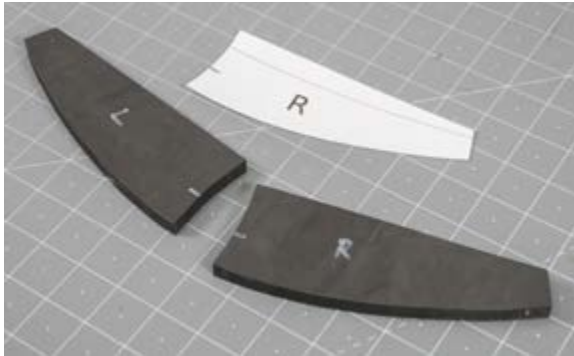
Then I glued those detail pieces to the larger base piece for both sides of the face mask.



Then I carefully glued these face pieces to the helmet. This was definitely a “take your time” moment in the build, but with the face taking shape it was difficult to contain my excitement!



Turning my attention to the rear of the helmet, I cut out the two pieces for the neck guard and glued them together. The line across the top of the pattern indicates where the rest of the helmet will overlap this piece.



The trim for the neck guard was made from a strip of 4mm thick foam, which is thin enough that I could wrap it around the edge of my neck guard. This is one of my very favorite properties of EVA foam.



**BEND FOAM**

I cut these strips longer than they needed to be and about 1" (25mm) wide. While they were still flat I scored the foam with a series of vertical cuts about 1/4" (6mm) apart. I also rounded the edges on this strip of foam and then hit them with a heat gun to open up all of those scored lines.



Next I brushed contact cement on the lower ½” (13mm) section on the bottom of the neck guard. The back of the lined foam strip was also brushed with contact cement so that I could simply press the parts together, trim it to length, and wrap this trim piece right around the bottom edge of the neck guard.



This same trim method was used on the bottom open edge of the main helmet piece too. Once both pieces of trim were attached to their respective pieces I could install the neck guard on the inside of the back of the helmet.



**ATTACH NECK GUARD**

The next batch of details were made for the sides and back of the helmet. Just like the face mask, these are made by cutting out one large bottom piece, cutting the pattern into smaller parts, and then using those to cut out the additional layers. I used a combination of 2mm and 5mm foam to add a variety in the height of each detail.



*Mirror the left and right side pieces, but only make one of the rear pieces.*

Some of these pieces are meant to fit snugly around the side horns. I found that I needed to trim my part just a little bit to get it to fit correctly.



Once I was happy with the fit, I glued the detail parts down. For the side horns there's one small piece at the top and a larger subassembly on the bottom.



The one rear piece was also glued in place.



The top of the helmet has several raised strips of detail. I made my strips about 8mm wide by cutting long lengths of 2mm foam with bevels on either side. I did this with a metal straight edge and I tilted the blade about 45 degrees while I made the cut. The strips were longer than I needed them to be to cover the top of the helmet.



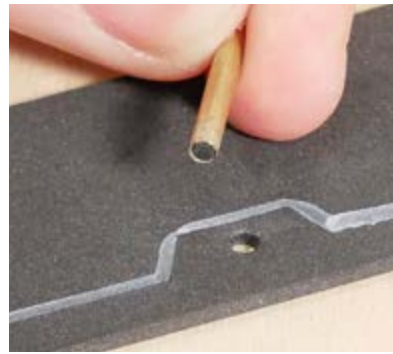
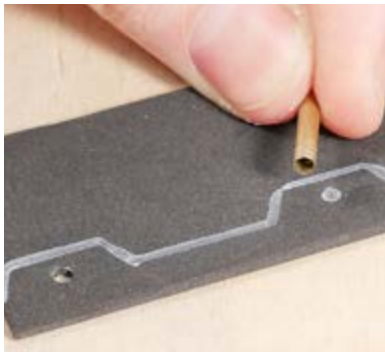


Each strip was glued down using contact cement. The strips wrapped around and down into our trench where I trimmed off the excess. I glued down several strips until the top portion of the helmet was covered.



Next I used my pattern to cut out these fancy trim pieces from 2mm thick foam. This pattern was repeated over and over to get a piece of trim long enough for my needs. The holes were punched out using a small, sharpened brass tube, but a hole punch would also work.





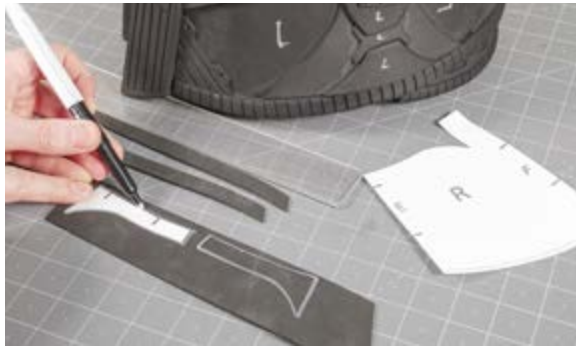
The rest of these trim pieces were cut out by hand with a hobby knife. Then I figured out where they would be placed on the helmet and modified them a little bit to get them to fit. Some of the protrusions needed to be cut off to fit around the side horns. These pieces were glued down along the top of the helmet and also along the edge of the neck guard.



I used some remaining trim pieces and a little bit of super glue to add a tiny bit more detail to the cheeks.



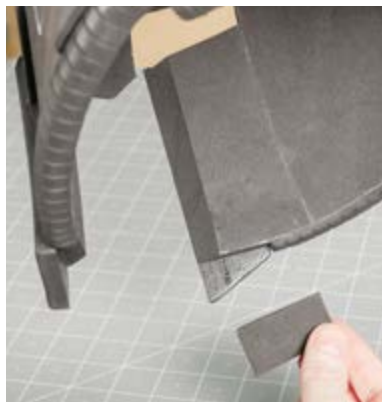
One of the last things to finish up was that trench around the mid line of my helmet. I reused the same pattern pieces I used to cut out the trench to make additional pieces from 2mm foam, specifically the shape in front of the side horns. The strip behind the side horns was a rectangular piece that I cut to fit. I scored some diagonal lines into the foam to add some nice detail and attached the parts to the helmet once they were warmed up with a heat gun.



That was the last bit of detail, but there were a couple more things I wanted to fix up before painting. I trimmed some material off the inner edge of the face mask. This helps give your face more breathing room and it also makes the helmet material appear a little thinner.



I also had a pesky overhang sticking out from the rear of the face mask. I glued a piece of foam into that spot to fill the area and then trimmed it flush with the rest of the face mask.



Another tricky issue with this helmet was the points of the face mask. They wanted to drift apart, so I glued some strips of foam into the back of the helmet. By curving the strips as I glue them down, they help the outer piece of foam stay more curled.



I could have fussed with every small detail for days, but I also really wanted to see what this helmet looked like painted, so I called the fabrication done and moved on to finishing. The first finishing step was to “heat seal” everything with my heat gun. This helps reduce any remaining “fuzzies” and makes the surface of the foam smoother.



To seal and prime my helmet, I used Plasti Dip. I sprayed 3-4 good, heavy layers and let it all dry overnight. I used Plasti Dip for this helmet because it's easy to apply, dries pretty quickly, and I like the look of the texture it leaves, specifically for the paint job I planned to apply.



# PAINING THE DWARVEN HELMET

Finally it was time to lay down some paint and with a helmet like this, the possibilities are endless. Since I was going for a Lord of the Rings dwarf inspired paint job, I looked through some of The Hobbit art books for inspiration.



From this point, you could paint your helmet in any way you like. I wanted to make mine as simple as possible, starting with a base coat of acrylic paint. This was a mixture of silver and black paint, thinned with a little bit of water. I used a mop brush to apply this thin mix to the entire helmet by hand.



*If you're impatient, like me, you can use a hair dryer to speed up drying times. Also, can you guess why my hair dryer is named "Humpty"?*



Once my dark metallic base coat was dry, I used some Rub 'n Buff "silver leaf" color to start bringing out the edge highlights and the texture left from the Plasti Dip. I put a little bit of the paint on my fingertip and then rubbed most of it off on a paper towel. Then I gently grazed the helmet surface with my finger, applying just the tiniest amount of paint.



There is definitely a knack to applying Rub 'n Buff in a controlled manner. It is extremely easy to put too much on and it's nearly impossible to remove, so take your time and practice on a scrap before committing to your final piece.



The effect is pretty subtle, but it adds another layer of contrast to our paint job that will help us out later on down the road. I used this treatment on all of the parts of the base helmet that were still exposed (not the detail layers), but you can put Rub 'n Buff wherever you like. I'm not the boss of you.



I decided the rest of the parts were going to be gold. The first layer of paint was made by mixing a gold and a brown acrylic paint together. This gave me a copper/bronze that was a great base color. This paint was applied with a flat brush and I only needed one good layer.



Next, this color got the Rub 'n Buff treatment, but with their "gold leaf" color instead. Just like the silver, I gently added this to the edges and surface texture of all my "gold" parts using my finger.



The left side of the helmet has not had the Rub 'n Buff added. You can see that the right side has far more contrast with the addition of those bright gold highlights.

*If you've picked up some new paint to try, make sure to do paint tests. Take a scrap piece of foam and apply all the layers of paint you're thinking about using. This helps with getting a look you're happy with and it also makes sure you don't have strange reactions between the different layers of paint.*



Here's the helmet with all of the colors added, but it was far too clean. To make my helmet feel more old and "lived in", it was going to need some weathering.

For things that are supposed to look like they're made out of metal, I prefer to use oil paints to do my weathering. These specific paints are "water mixable" which means they can be thinned with water. I like to thin them just a little bit to help spread these greasy paints around my helmet surface.



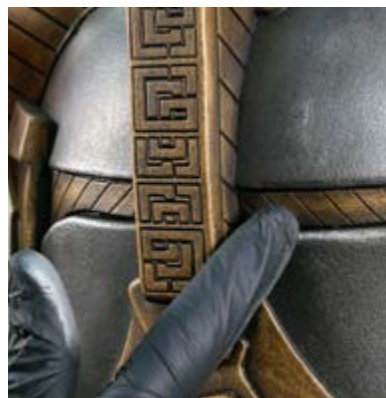
## WATER MIXABLE OIL PAINT

Next I did a thorough wash with my oil paints over the entire helmet. Working in sections I covered the area in paint, making sure to drive the brush down into all of the crevices and details. Then I wiped most of that paint away, leaving some in the recesses to make it look like grease and dirt has been stuck there for years.



I repeated this step over the entire helmet and it definitely turned out looking super dirty. The only downside is that I lost some of those great metallic highlights from that first pass of Rub 'n Buff.

So, I grabbed my silver and gold Rub 'n Buff and spruced up some areas around the helmet to bring back some of that delicious, shiny contrast.



**That last hit of highlight  
paint was exactly what  
it took to finish this  
helmet off in style!**



# Part 4

## Organic Mask

Difficulty: 4/5

Foam Used: SKS HD Foam

8mm: 1 Sheet

Foam Clay: 1 Small Tub

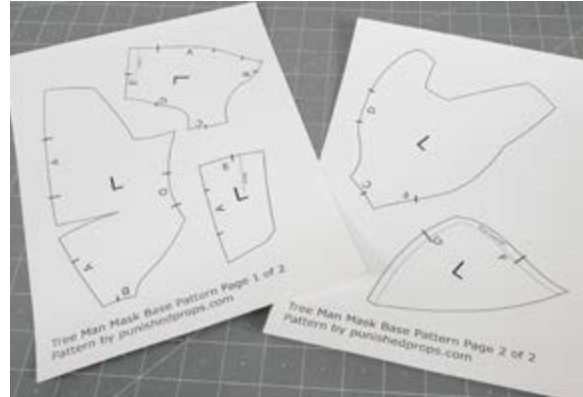
Get your free digital files here:  
[www.punishedprops.com/foamsmith3](http://www.punishedprops.com/foamsmith3)

This is a mask that I designed to specifically show off some of the more organic finishes you can get with foam. I wanted to make a tree creature, something of a cross between Groot and a Spriggan (Elder Scrolls).



# ORGANIC MASK BUILD

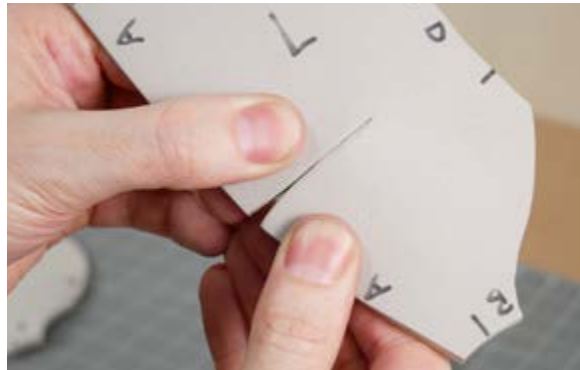
I've made a downloadable pattern to get this build started yourself. This pattern was created by taking a rough tape template of my head form and eyeballing the additional, tree-like features.



This pattern is used for both the left and right side, which makes the face symmetrical. You can keep your tree creature that way or modify it to whatever you think looks good. You could even make it some other kind of fantastical creature! I started by using the patterns to cut out all of my base form pieces and lined them up for gluing.



I heat formed all of my parts a little bit and then started the glue-up with the darts on the forehead.



Then I glued all of the face parts together according to the seam letters and registration marks using contact cement.



First one half, then the other! The last seam I attached was the seam right down the middle of the face, pinching the bridge of the nose together as the final step.

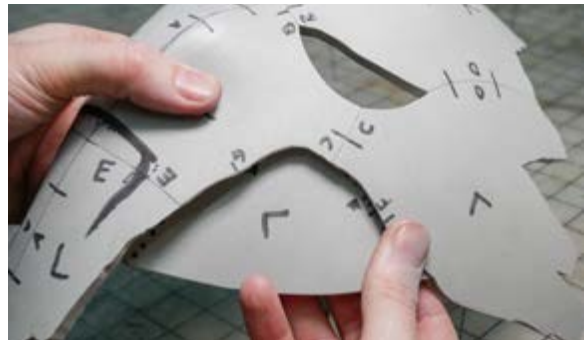


Next I plotted a new, rough hewn edge for my mask. This is the first step I took towards a more organic form. My goal was to make this face layer look like thick bark. I trimmed away some of the material to break up the clean edges and make the face less symmetrical.



Then I used my rotary tool to sand around those edges, making the cut edges look less straight and unnatural. I also put a bevel under the edges that will eventually overlap the cheeks. This should help the cheeks look a bit more “sunk in”.





Then I could glue the cheeks in place, using more contact cement.



To make my foam look more like bark, I picked a handful of spots that I could split apart with a knife so that the two pieces were no longer flush, and then I glued the seam back together.



Next I plotted out where I wanted my mouth to be placed. I went for a grumpy old man frown, but feel free to get creative with your creature's expression. When I was happy with the shape of my mouth, I cut the mouth slit open with a sharp knife and glued it open, just like the "bark cracks" earlier.



Before moving forward I decided it was time to attach the mask to a head form, which made working on the mask much easier. I hot glued an elastic strap to the inside of my mask. The strap was attached just behind the eyes. I also cut up some squishy foam and hot glued it to the cheeks and forehead area. This was far more comfortable to wear.



Just a little bit more trimming on the cheeks and my mask was ready to move onto the next exciting step! Sculpting!



To plan the next steps, I actually took a photograph of my mask, printed out several copies of that photo, and then did some sketches on the rough template. I figured out which areas would be carved into the surface of the foam (cracks) and which areas would have material added to them (eyebrows). I plotted these out using a marker before committing to anything permanent.



To get the outline for my eyebrows, I used a piece of cheap masking tape that was transparent enough to trace my lines. These were used as patterns to cut my eyebrows from a piece of 8mm thick foam.



I cut these to rough shape and then used my rotary tool to trim right up to the edge of my lines. I also put a bevel under the edges of the eyebrows. This technique ends up turning a lot of foam into dust, so I recommend wearing a dust mask and at the very least running a vacuum near your work to keep most of that dust from getting into the air.



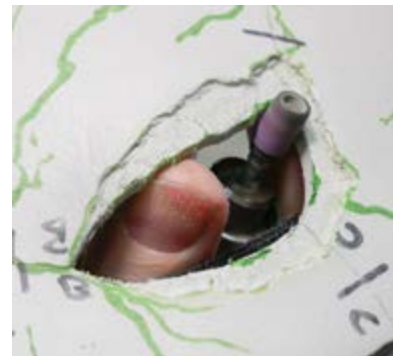


## DUST MANAGEMENT

I glued the eyebrows together and did a quick test fit to be totally sure my tree guy could rock the uni brow. Spoiler: he can.



To add another layer of detail to my mask, I used my rotary tool to chew away the area around the eyes. I wanted the eyes to be sunken in, like they were made from a lower layer of wood.



The next destructive step included a hot knife! This definitely requires you to work in a well ventilated area while wearing an appropriate respirator.



I used a variety of tips in my hot knife to start sculpting the different areas of my mask. I was able to sharpen up the sunken in eye sockets, for example.



I also went over the outer “bark” areas and accentuated any areas that might have large cracks in them. Any of the areas that I split earlier were perfect for this.



For a nose, I cut out a couple of vertical slots, all the way through the foam. Then I used the hot knife to sculpt the nostrils so that they looked like large cracks in the bark.



**NOSTRIL HOLES LOOK COOL, AND PROVIDE AIR FLOW!**

For the cheeks I burned in thin lines to try and simulate wood grain. I figured that if the face was meant to be bark, the cheeks would be the exposed wood beneath.



With the hot knife sculpting all wrapped up, it was time to glue on my glorious uni brow!



I also wanted to add a couple more pieces of “bark” coming off the back edge of my tree man’s face. These bark pieces were cut from scraps of foam with a large bevel along the front edge. This bevel makes the bark stick out from behind the rest of the mask at a different angle than the rest of the bark.



Before moving onto the next bit of sculpting, I took some time to clean up all of the sharp edges anywhere on my mask. I used my rotary tool to round over all of the bark edges, lips, and any remaining seams.



The rest of the details on my mask were made with foam clay. I used less than half a small tub of clay, along with just a couple of basic tools, and some water.



It's best to work in small batches. I pulled out a small handful of clay and then resealed the bag. Just to be totally safe I put the bag back into the bucket and sealed *that* too. Leaving the bag open for a long period of time could dry out all of your unused clay.



I picked a small area to work on and brushed a little bit of water onto the surface with my finger. Then I kind of just mushed a bunch of clay all over that area. I put on enough clay so that it was thick enough for me to add the depth of detail I required, about 1/8" (3mm). I really massaged the clay into the foam to get it to stick.



Then I used my tools to start tracing some of the details I had already carved into the foam. Along with those wider details, I added some thinner cracks, trying to mimic a chunky bark texture.



To really shake things up, I wrapped my finger in aluminum foil and used that to press some random textures into the surface of the foam. This interrupted some of the crack details I added earlier, but they were easy enough to touch up. I ended up going back and forth between the two tools a whole lot during this step.



Something to keep in mind with foam clay is how it shrinks as it dries. I found that a lot of my foil texture actually disappeared as the foam clay dried. Not the end of the world, but definitely something to keep in mind when working with this material.



I kept working in these small batches all over the face. I even took photos of the trees outside my shop to use as a reference for my sculpt. In some areas I bulked up the face form a little bit with additional clay to try and give my tree man something that resembled a realistic facial anatomy.

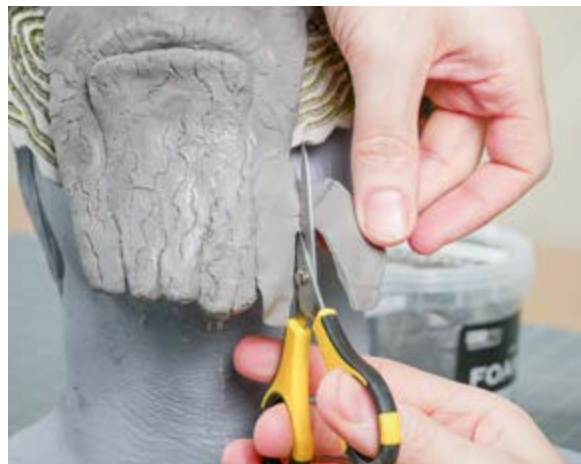


The lips definitely required some bulking. I made clay snakes to add some mass to the lips before blending them with the rest of the face and sculpting in the details.





*I've found that it can be difficult to cut foam clay using a knife. Instead, a pair of scissors are fantastic for nipping off a small bit of extra clay.*



The last bit of foam clay work was on the cheeks. I really just used the clay to make the surface a bit more uneven and natural looking. I tried my best to not fill in the "wood grain" lines.



I let the foam clay dry overnight before doing any more work. At this point anyone would be surprised to find out that it was originally made from sheets of foam. We can argue whether or not I made it look like tree bark all day, but it definitely no longer looks like foam!

To seal this mask, I went with neoprene. I think it's a great match for the organic look of this project since it's easy to apply and works well with standard acrylic paints. This brand comes with a thickener that I used to help the liquid cling to my foam a little better.



*For sealing and painting helmets I'll bag up my head form to keep it as clean as possible while holding my headgear.*



I brushed on my first layer of neoprene. In hindsight, a sponge brush would have been better, but I did OK with a chip brush. I worked quickly to cover every surface and make sure I got at least a little bit of neoprene down in all the cracks and crevices.



I did get a little bit of “pilling”. This is when some of the neoprene dries and your paint brush picks it back up and then deposits the crumbles somewhere else on your piece. For this project, a little extra texture is OK, but a sponge brush would have helped. I also could have worked a little bit quicker.



### DRIED BITS CAUSE PILLING

I let that first layer dry for a couple of hours and then sprayed on a few more. I used my siphon “Critter” sprayer to hose down the surface with a nice, even layer of neoprene. I let each layer dry for about an hour before spraying on another. I think I ended up doing 3-4 sprayed layers and then let it all dry overnight.



# PAINTING THE MASK

Time for paint, starting with some dark, woody base colors! I used an assortment of some of my favorite acrylic paints, all applied with brushes. I started with a very dark brown that I used to cover the back of the mask. This was to make sure none of the bare foam was visible from the back of the mask while it was being worn.



Then I painted the front, focusing on getting this dark brown paint down in the low spots and cracks on the mask.



When that layer was dry enough, I brushed on a slightly lighter layer of brown. This was brushed all over the mask, but I didn't worry too much about covering every surface, especially making sure to miss all of the low, dark areas.



Then I mixed up an even lighter brown for one more pass, covering even less of the details.



Yes, this was a very time consuming way to make a mask look brown, but up close you can see I was able to layer some nice texture there. It will end up mostly being covered up, but wherever it peeks out is going to help sell that this is bark.



The next batch of paint I mixed up was a very light gray with just a hint of brown tossed in there. This warm gray was applied with a stippling brush, focusing on the highest areas of bark. I purposely did not totally cover every area I painted, instead leaving a more “mottled” look.



I applied this gray paint in a couple of passes in a couple of different values, bouncing between light and dark. Areas like the eyebrows, nose, and lips were highlighted with the lighter gray.



To help our tree man fit right in here in the Pacific Northwest, I gave him a touch of moss. You can do this with any acrylic paints, but I got my hands on this two paint system from Plaid Crafts, specifically made to simulate moss. I use my stippling brushes again, first tapping on a small amount of the darker green. Then, while that was still wet, I used a fresh brush to tap on some of the lighter green. I went back and forth, blending the paints a little bit, until it looked like natural moss.



*This part was extremely satisfying. Something about adding that splash of color really “made” this project for me.*



To finish up the cheeks I lightly brushed on a couple of varieties of brown until I got the right “raw timber” look that I was after. I also used those colors to lighten the edges of the eyelids.



I let all of that paint dry and then gave the whole mask a clear coat. I wanted to make sure this paint would be protected from the further weathering steps I had planned. To knock back the shine of my “bark” I used a matte varnish to clear coat the mask.



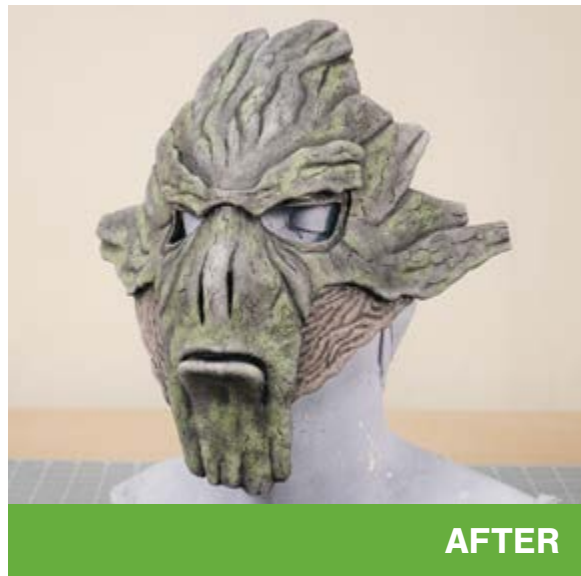
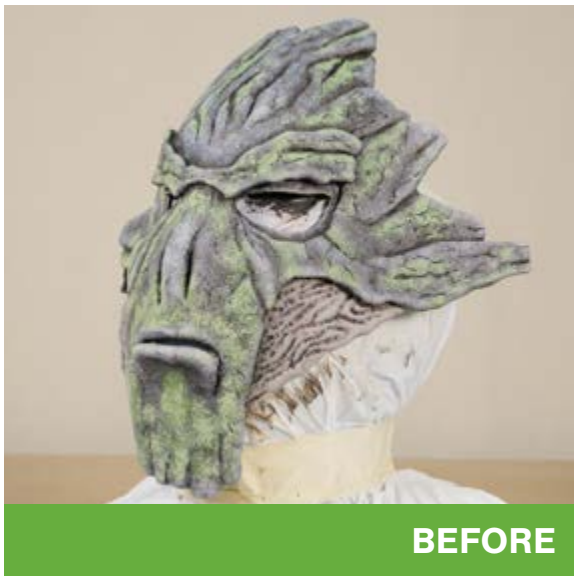
While I was really overjoyed with the paint job so far, I knew it would benefit from a dark wash. I mixed up some black and brown acrylic paints, along with a splash of water, and got busy dirtying up the mask. Working in small batches, I brushed a bunch of my dark paint all over a part of the mask and then wiped most of it away with a towel.



This was a basic dark wash and I mostly focused on making sure the low spots and cracks looked dark and contrasty enough.



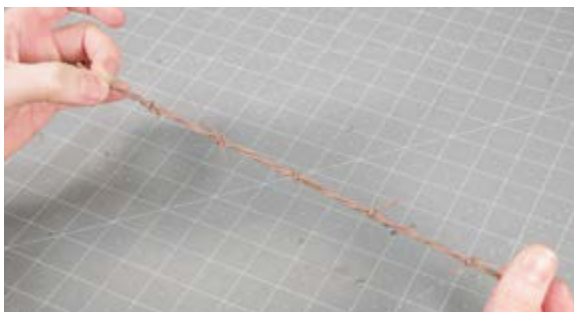
This dark wash really knocked back the saturation on my mask and I think it really helped it look a lot more like it came from the real world.



For a fun addition, I made a neat accessory out of brown 2mm foam. I cut some super thin strips of foam and tied them together to copy what barbed wire looks like.



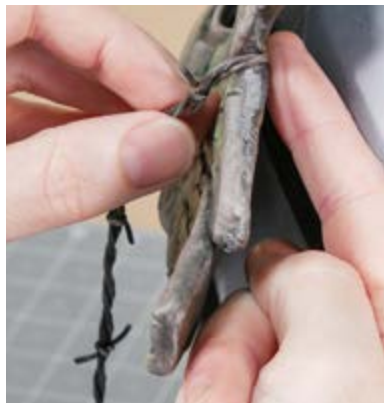
Then I hand twisted my “barbed wire”, taped it down to a sturdy surface, and heated it up with a heat gun. When it cooled, I peeled away the tape and the foam stayed in its twisted form.



Then I did a wash of black paint all over my wire, darkening it a bit. I also found it useful to super glue the ends together to keep them from unwinding. Finally, I used a touch of silver Rub n' Buff to add a metallic shine, totally selling it as old barbed wire!



I super glued my wire around one of the bark pieces on my mask. I tried to pick a place that my tree man might think was fashionable.



To really sell my barbed wire, I added a little bit of rust paint. Like the moss, you can do something similar with basic acrylic paints, but I used a pre-made paint system from Plaid Crafts. I started by brushing on the darker rust paint, focusing on areas where the rust might pool next to the wood when it gets wet. Then, when that paint was still wet, I added a dash of the lighter rust paint. I let that dry and then did a quick dark wash to knock the color back a bit.





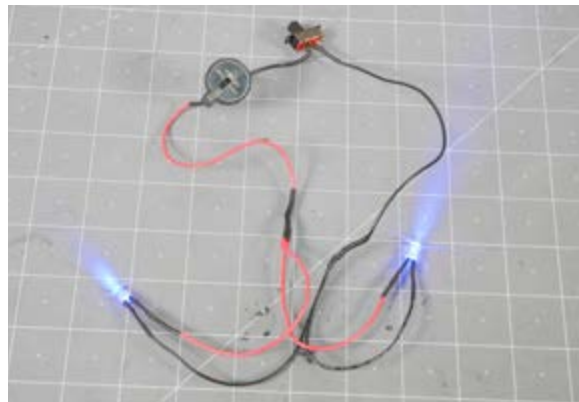
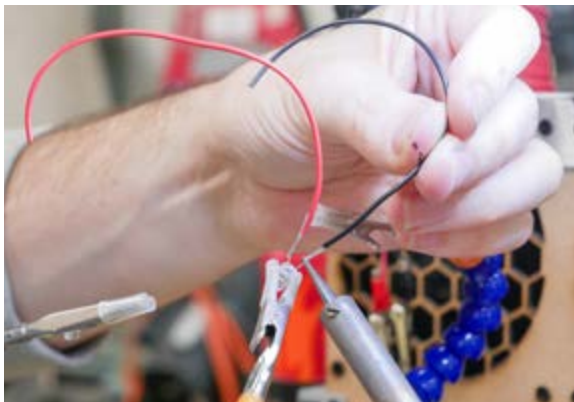
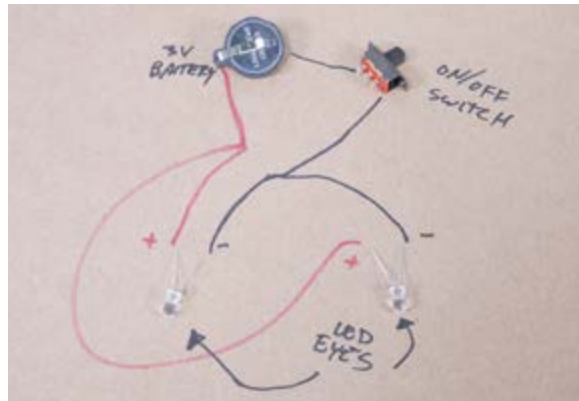
I did one more quick pass of silver Rub 'n Buff on my barbed wire and that really sold the whole feature. That finished up the painting on this mask and I was really happy with how mine turned out. It just needs one more thing.



**RUB 'N BUFF HIGHLIGHT**



Glowing eyes! Of course a weird tree man, forest spirit guy would have glowing eyes. To keep things simple I picked up some blue LEDs that run off of 3v. I ran an LED to each eye in parallel. Both LEDs were powered by a single 3v coin cell with a switch in the circuit to turn the eyes on and off.



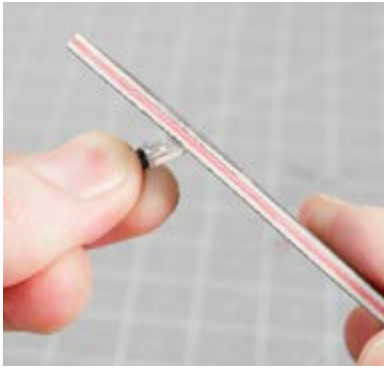
**PARALLEL CIRCUIT**

To make my eyes I squirted a circle of hot glue onto a piece of parchment paper. When this circle of glue cooled, I peeled it off, creating a small milky disc.



**HOT GLUE**

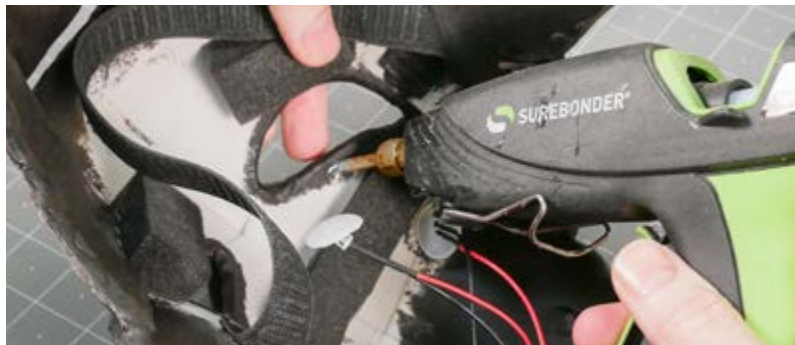
Before gluing my LEDs to the disc, I sanded the ends off at about a 45 degree angle. Then I put a little hot glue on the flat back of each disc and attached the LEDs.



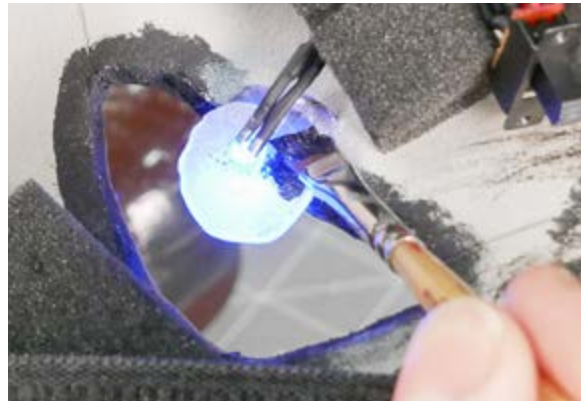
This hot glue cools to a milky color that does a great job of diffusing light, so our LEDs make a really great glowing circle in our hot glue pupils.



This glowing eyeball contraption was then hot glued into the mask. I glued the eyes directly to the inside of the upper eyelid.



To keep all that blue light from blasting my vision all day I painted the backs of the glowing eyes. I started with a layer of silver and then black. My thought is that the silver will help reflect the light out and the black will block it from my eyes.



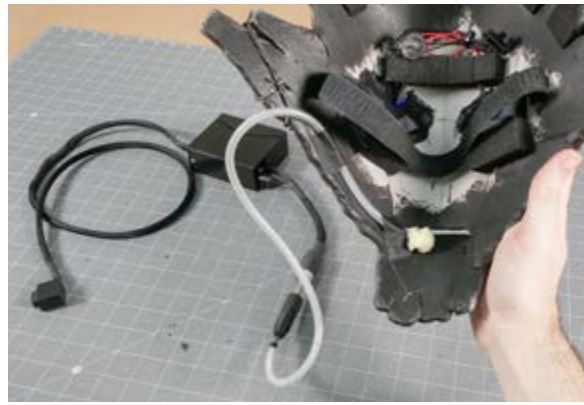
Finally I cut out a couple of pieces of thin, sheer black fabric to cover the eye sockets. I also cut a slit to accommodate the LED wires.



**SHEER FABRIC**

I placed the fabric in the correct spot over the eye and carefully tacked it down around the eye hole using hot glue.





That was the very last step in this mask creation, but as a bonus I played around a little bit with my fog machine to show you what you could do to enhance a mask like this. I put the fog tube with some foam diffusion pointed out of the mouth of my mask. The result is pretty cool and could be used to great effect in so many ways.



**WE GET IT BRO, YOU VAPE**



# WRAPPING THINGS UP

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I sincerely thank you for picking up and reading my book, but what I really, truly, deeply appreciate is when you build along with my projects and share your creations with me. My goal with these books is to compel you to make something with your hands and fully engage in the creative process. Hopefully this book has sparked some kind of idea in your brain that you just can't not act on.

And when you finish that creation, whether it's your very first helmet or your 100th, I would really love to see how it turned out. I cannot fully explain what an amazing treat it is for me to get to enjoy the thousands of extraordinary photos of projects from all around the world. So, thank you for not only playing along, but thanks for sharing too.

Please be kind,  
-Bill





“What are you waiting for?  
Go get your paws dirty!”  
- Buddhacat