



## Lightsabers, Graflex's and Meta How to make a Star Wa

# GRAFLICA

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## Where to Begin ....

So you always wanted to have your very own Lightsaber. When I was a kid the best you got was a torch as a hilt with a plastic tube on it which lit up (not believable from less than a hundred yards). Now you can get much better but still not what you'd call a replica.

Many of the props used in the original Star Wars movies (especially A New Hope) were put together the old fashioned way. Not by CGI, not by first going through a design team but by the prop guys looking around for inspiration. They found inspiration for Luke and Vader's Lightsabers in 1940's press camera flashes.

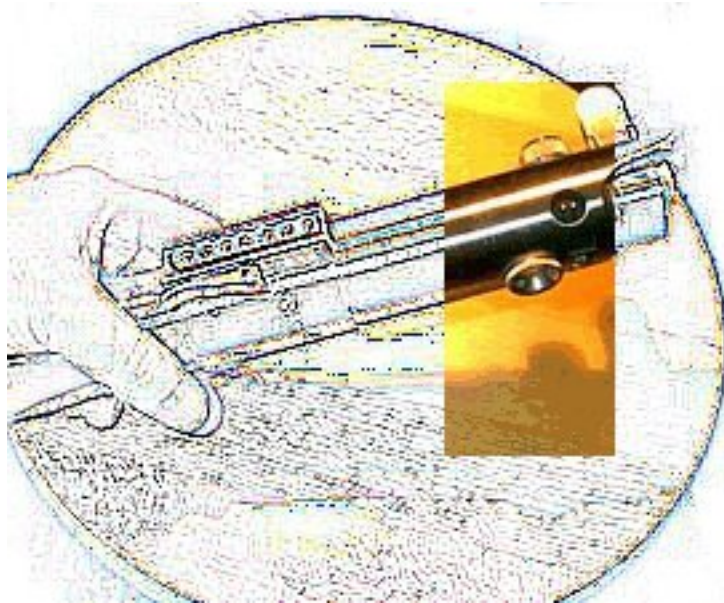
So, easy, just go to an antiques market and get one then customise it to look just like ..... and there's the problem, you see you can't. Well not over here in Britain anyway, the Graflex 3 cell camera flash was made in Rochester in the US and I've only seen one, in a specialist camera shop off New Bond St attached to a camera and selling for £500. In the States it's not that much easier unless you're prepared to pay through the nose.

The only alternative is to make one and believe it or not this is not as hard as it sounds. It's difficult but it can be done and the purpose of this site is to show you how.

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# The Gallery ...

Here are some pictures of the finished item. This is what you should end up with!









































## Tools and how to use them...

You will need a fairly good set of tools before you begin. If you have never worked with metal before then be aware that it is a slow process making some of the parts for this project.

Your main two tools will be a Dremel and a good set of files. A Dremel is a rotary multi tool, there are other brands out there and you should shop around to see if you can get a bargain - they are not cheap but they are essential for some of the cutting work you'll need to do (don't buy a rechargeable, they are not worth the convenience). When getting one make sure you get some reinforced cutting disks as well otherwise you'll find you are going through disks very quickly. To go with your Dremel you MUST have some protective eyewear, finishing your project will not be easy if you can't see it!!! Your next main tool will be a large half round file. This is another essential, when filing curves change angles as you file. This way you can follow the lines on templates much more easily, if you don't you'll get all the wrong curves in the metal and have to start again. Another file I've found useful is a flat course file, this is good for taking off deep cuts of metal quickly, though you'll need to move down to a finer file for finishing up to the edges of templates.

The next most used is a hacksaw, get an old fashioned one like the one in the picture, I've tried a few and though the others may be more comfortable to use the old ones cut straighter lines. A set of GOOD needle files are next, try to remember you have a whole set of these and they are good for lots of finishing jobs.

You can't rely on your Dremel for all the drilling jobs, there is no substitute for a power drill and you can't get a 13mm drill into a Dremel (I use a cheap rechargeable and a mains power drill), you'll need to get your goggles on for the drilling work too.

You will need to cut sheet metal for many parts of this so get a good pair of metal shears or tin snips, I have used a pair from RS for ages and they are better than anything else I've found, they are here.

You will need to hold the various parts whilst working on them, for this I find a [Workmate](#) the best. This is great for holding items like the tubing. For smaller bits you will need a small vice.



## Working Tips ...

Firstly - SAFETY! You remember the bit about goggles in the tools section? Good - just checking! Use them when Dremelling, drilling or any other actions that use high speed bits or cutters, also wear them when cutting sheet metal, small bits of high speed steel CAN blind you if they hit your eye.

There's nothing more annoying than getting a good cut and a good finish on a piece of metal and then putting a nice deep scratch in it. For that reason my biggest tip is COVER IT! This applies most heavily to the main tube and clamp tube. Once you have a template stuck in place or have made your cuts tape up the metal, even if only with masking tape. Just brushing against the tube with a heavy tool can cause a deep scratch which no amount of sanding will get rid of.

The same applies to your tools, it's no good getting the angle of a bend exactly right with a pair of pliers only to find deep score lines in the metal when you release your grip. So put some tape around any parts of tools which you will be using to grip metal, this softens the grip and ensures that they will not mark the metal.

Drilling holes can be disasterous. Always use a center punch to give you a indent to start from, this stops the drill skipping across the metal. Next use a small drill to give you a pilot hole, from the pilot you can make a properly centered hole.

Glueing metal to metal is not easy, firstly don't believe the packaging on most glues. Almost all of them list metal as being something they can glue but we are going for bonding rather than just lightly attaching! You could try epoxy but I found it fractured apart when hardened. The best way to find the best for you is to try a few. Remember when glueing anything to clean it first then give it a roughened surface for the glue to key into.

If at first you don't succede..... You will make mistakes, sometimes they will cost you lots of time. Don't let this get you down - everyone does it, it's part of the deal.

In an ideal world all working environments would be clean, tidy and comfortable, ahem ...



The best tip is HAVE FUN! You are doing this because you enjoy it, you can walk away at any time and no one will care but you. But then..... that is the path to the dark side.



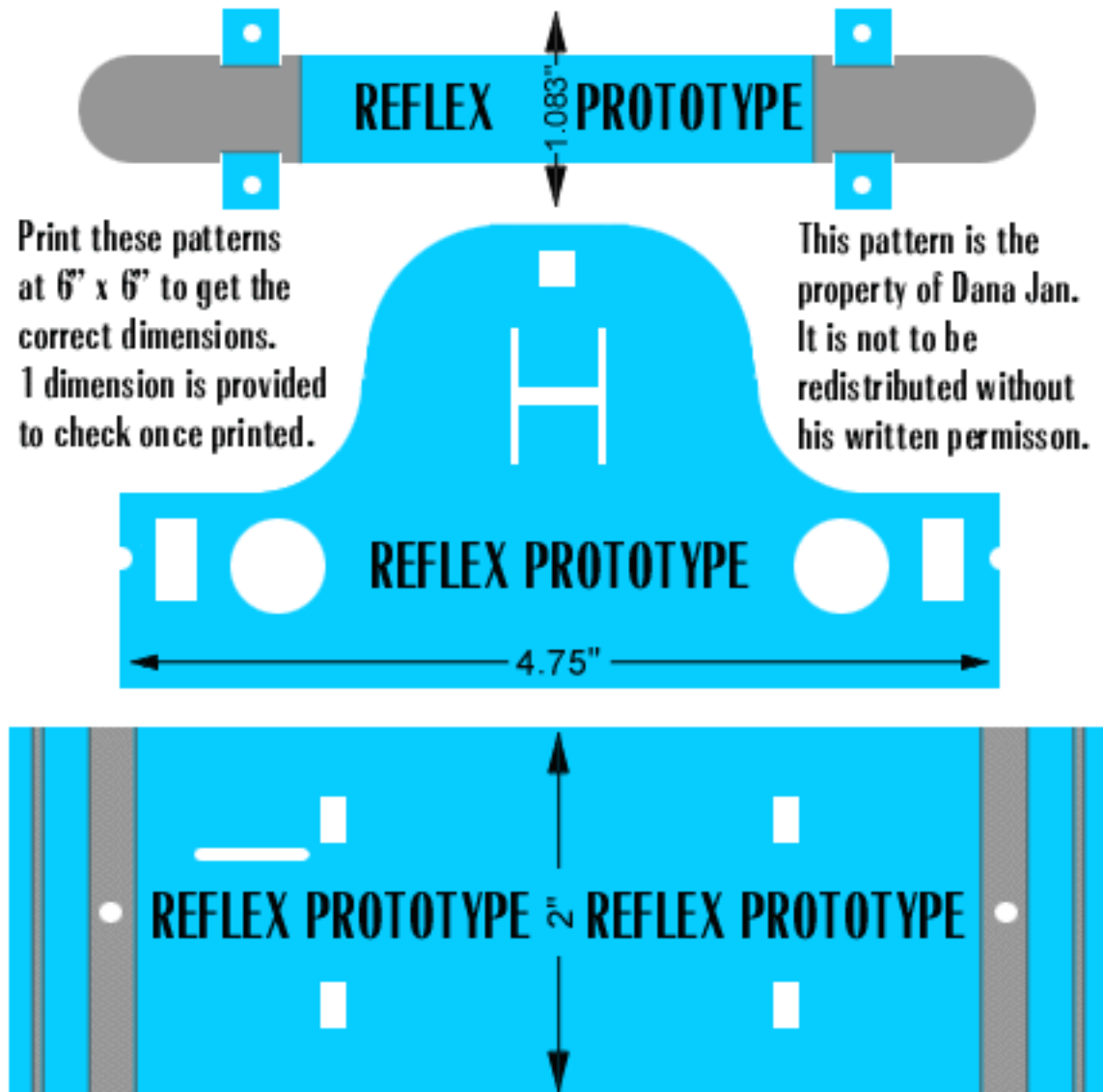
## The Parts ...

One of the hardest things I found when starting this project was finding the correctly sized parts from which to make the replica. Hopefully I will remove the long search section which I had to go through and allow you to get right down to work. If you like the hunt (and to be honest I do!) then you could always consider skipping this bit (!) All you need is the dimensions :-)

Main Tube	1 1/2" ERW (electrical resistance welded) steel tubing part no314-0583	<a href="#">RS</a>	£8.67
Clamp Tube	Cut from same tubing as the main tube		
Red Button	Custom made	Doug Stoneman/EBay	Approx \$10
Test Eye	Custom made	Doug Stoneman/EBay	Approx \$10
End Plug	Metal Hole Plug	B&Q	£1.50
Inner Black Tube	1 1/4" Waste Pipe	B&Q	£2
Emitter Clamp Box	U Section Aluminium Rod	B&Q - Hardware Section	£2
Emitter Clamp Lever	U Section Aluminium Rod	B&Q - Hardware Section	£2
Emitter End Plug (Black)	Camera Film Canister	Home	-
Recharge Socket Pins	DIN Plug	Tandy (US Radio Shack)	£1.09
Calculator Bubbles	Transparent Rubber Feet	B&Q	£*
Rubber Grips	Custom Made	Yoda's House	\$5 per metre
Emitter Assembly + various	Sheet Steel		
Various Parts	Nails, panel pins, screws, Foil tape (B&Q), D ring (B&Q)		

# Template ...

The following template is from the Reflex site which is now sadly down. To save the file right click on the image. Size the image on printing following the instructions on the template.

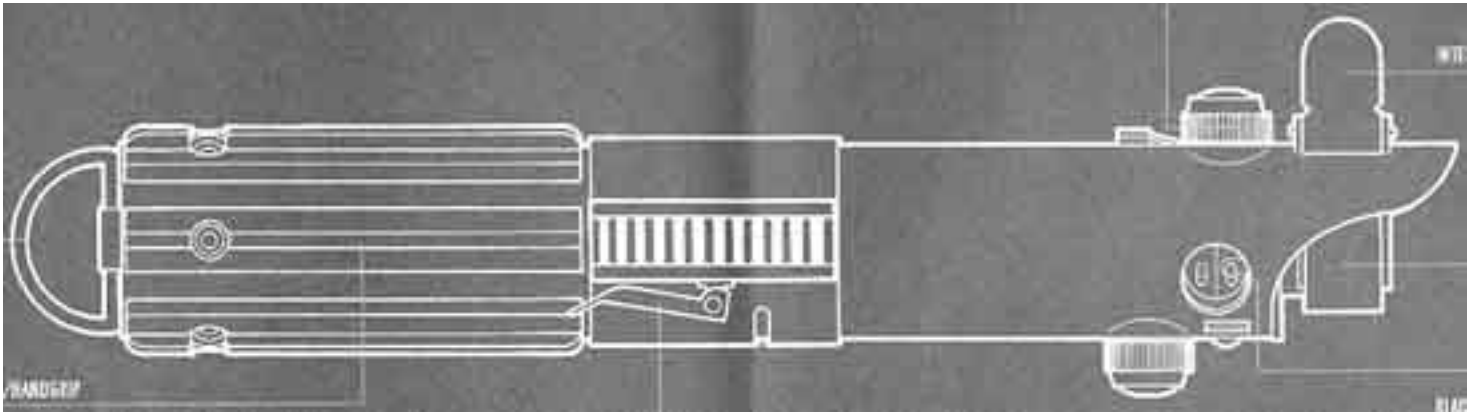


Print these patterns at 6" x 6" to get the correct dimensions. 1 dimension is provided to check once printed.

This pattern is the property of Dana Jan. It is not to be redistributed without his written permission.

## Reference ...

The following image I found essential for checking the positioning of parts on the replica. Printed at the right size all the dimensions check out against a Graflex.





## Making the main tube and clamp band

You start with the steel tube, cut two sections off this with a hacksaw or the Dremel, One of 10 3/4" and one of 2 1/4". You could glue a piece of paper with a straight edge around what is to be the bottom in order to get the cut flat, I just cut it without and filed it down. These are slightly longer than the finished items as it is unlikely that you will get the ends flat initially (if you are using a Dremel for the cuts then you stand a better chance so make the smaller piece closer to 2" but leave a little over to finish up to the template with a file in the next section).

Now is a good time to do most of the surface finishing on the tubing as once you have cut the emitter shape you will have trouble sanding radially. The finish looks terrible at this point but don't let that put you off. Sand with very course paper to start with as you will need to go some way to get rid of the weld seam. Put the paper in one hand grip the tube and turn it with the other. When the seam is disappearing move down grades until you are working with a very shiny tube (recognise the finish now?). Now you will need to cut the weld on the small section, once this is done you will need to VERY carefully reshape it to fit around the main tube, do this by opening up the gap then a mixture of pushing it flat from the cut edge and wedging some wood in the gap and pushing the sides together (this is maddening but you'll get it right eventually).

At this point we all say THANK YOU REFLEX FOR THE TEMPLATES!! The Reflex site is sadly no more so I have placed the template in the template section.



Print the templates out so that the measurements on the paper are correct then stick around the small tube with PVA glue, if you get it wrong then use hot water to get it off and try again. On the small section you can now use course then medium files to file up to the edge of the template.

On the main tube file one end flat and glue the template so that end to end the tube is 10 1/2"





Use the Dremel to cut the slots which make the "ear" mounting tabs (use the Dremel first on the outside then on the inside, this way you avoid overcutting on the outside of the tube). Next cut almost to the edge of the template as shown above, this way you can use the half round file with more control to finish down to the line (this is surprisingly quick).

Once you are happy with the shape you can start on the details on the template. Remember to use a center punch and a pilot holes when drilling. For the two rectangles start by drilling two holes side by side inside the rectangle and then work out with needle files to the shape of the template. Go into the corners with a triangular (not square) file. The same process (with

single drilled holes) for the small square hole on top and the rectangles on the short "clamp" tube. For the slot on the clamp tube you will need to drill a hole at one end, cut from here with the Dremel and gradually open this up to the template with needle files.

It's up to you when you bend up the tabs, I did it at this point but it is probably easier to do this very late so that you can refinish with fine sandpaper before you laquer. When you do it carefully push them out from the inside with a large screwdriver until they have raised enough to grip them with a small pair of pliers (taped up remember) and then bend them to vertical. Now use a half round needle file on the flat edges of this hole to widen it slightly, you are trying to make two slots which the emitter "ears" can be fed through.

By now you should have this (this shows the parts before the holes were cut) .....





## Making the emitter



The emitter is one of the smaller but quite demanding pieces, this is where we test your sheet cutting abilities :-)

Firstly cut out the paper emitter template left over from the Reflex sheet. From this you will need to cut off the ears as we are going to make these separately, I found the whole template too difficult to cut from the steel in one go. Cut down two rectangles of steel with the shears big enough to fit a single ear onto. Sand your finish on these now as it is easier than trying to do a fiddly little piece afterwards. Next cut around the template with the shears but leave a margin of a few millimeters as you cannot cut into the corners without marking the surface of the metal. You can drill the holes now. Next put the piece in the vice and file down to the edge of the template.

Grip the ears in the vice and use a hacksaw to cut down the side of the tabs so that they will bend in as in the picture. You will need to cut in a little further on one side than the other. Do this on both of the ears and do it on the same side so that they are identical (not mirror images of each other), now when you put them together as they will be when in place they should line up without being offset (all this makes more sense when you are doing it).

You will need to bend a clean angle in the end of the ear where it will attach to the emitter band, to do this you will need to score a line in the metal with the triangular needle file on the opposite side from the direction you want to bend it. Once you have a deep score line you should be able to bend it with the pliers.

Finish the edges with sandpaper to round them off a little.



Cut a strip of steel the same width as the Reflex template but a little longer. Now wrap this around a cylinder (look around the house for something approximating the diameter, the bathroom is a good bet) to get a clean cylinder shape.

Next the two bits which fit inside this band. For these cut two small pieces, make these slightly wider and longer than they need to be. Push them around the shaft of, say, a hammer and then trim off the two ends which remain straight (now you should have two curves which approximately match your emitter band). Now the clever bit, you should have these pieces oversized along the edge of the curve as well. Cut the two ends down with your shears or scissors, because you are cutting along a curved edge they should splay outwards slightly, giving the effect of a real Graflex emitter band.

Glue all these in place making sure that they fit into the tube and that the holes line up.

## Making the clamp



The clamp is very easy to make compared to most of the other parts, the main reason being that it is based on a short section of aluminium square "U" section rod.



Cut a section the same length as the clamp tube. Next cut two pieces of steel which will stick to the sides of this and wrap around the ends so that they touch each other in the middle of the two ends. To get them to wrap neatly file slots with the triangular needle file on the inside where you want to bend them, this will make the bends near 90 degrees rather than a curve.

Cut two sections of the umbrella frame and now stick the whole lot together!



To make the clamp lever take the smaller "U" section aluminium rod and cut a diagonal line from the open side up to (but not through) the flat top section. Now cut off just past this and cut horizontally from the cut off end up to the diagonal cut, this gives you the little upturn of the lever at the end. Now file all the edges to the profile you want and polish up with sandpaper. Finally drill through from one side the two holes for the pin.

For the activation bubbles cut a small piece of steel (it doesn't have to fit exactly) and cover it with foil tape. Place seven clear rubber feet on this so that they go almost up to the ends (if they have a border around them then cut this off in a straight line on both sides except for the ones at the ends. Now just slide it into place!

## The Finish...

Just a quick note on the finish of the tube. You may notice that the tube (and other parts) tarnish slightly where you touch them, this I guess is the action of salt and moisture.

I've seen others recommend very fine sanding to avoid this but I just couldn't make it go away. In the end the way I found to get around this was to laquer the affected parts with clear auto laquer.

This a little "make or break" as if it screws up then you will need to use a chemical stripper to get rid of it before you can start again. All I can recommend is that you follow the instructions on the can, if it says shake for five minutes then DO IT. I had to make some corrections and still wasn't entirely happy with the finish on the main tube. When I did the clamp band it turned out perfectly, so be careful!

## Putting it all together



Okay, by now you should have a main tube, a clamp band, an emitter assembly and a clamp assembly. Now for the rest!



Firstly, lets get the clamp band onto the main tube. You can use the [plan](#) to estimate where the band goes (I put the bottom edge 90mm from the base of the main tube), put some grease on the inside as we will use a screw to keep it in place like the original. Once it's in the right place mark and drill a hole for the the clamp band screw the right size to screw into securely (I did all this with the band in place).





Very carefully you can now glue the clamp assembly in place. If you want to be able to remove it again then you'll have to have a think because I didn't do this :]



Now take the black waste tube and cut a section then cut down the side so it can be opened up (as it's not quite wide enough - but we'll solve that). Drill a hole for the screw above the eye and the two recharge sockets, leave it little higher than the edge of the tube to give the correct look. You will need to use a craft knife to trim the edges of the cuts as they are left ragged by the drill. Now is a good time to cut out the sections for the other holes as well.





You can now try this for size with the camera film canister, place this down a little inside the waste tube when you put them in the main tube. The canister and waste tube should fit perfectly.

Cut the pins from the DIN plug and drill two small holes for them in each of the recharge plug holes, glue them in place with superglue. You can also now put a nail through the centre of the film canister and put the emitter assembly and the eye in place (use a small nail or panel pin for the emitter hinge).



Cut some detailing like the ones in the picture and glue them in place before glueing on the button.



Take a strip of steel and bend a right angle in it, now wrap it around the D-ring, round off the end and drill two holes through this tab and the end plug. Screw them onto the end plug. Glue this in place in the bottom of the tube.

## Thanks to ...

The main thanks for this site go to the excellent Reflex site which is now sadly defunct.

Also deserving a considerable applause are all the helpful people on the excellent Star Wars Prop Replicas EZboard site .....