PEAK OF FLIGHT NEWSLETTER

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PEAK OF FLIGHT

How to Make Custom Decals

By Samer Najia

Why do custom decals?

I find that I need to use custom decals under a number of circumstances that you may or may not have encountered yet:

- You downloaded some cool plans for a rocket design, but the finished design includes a decal pattern you want to use.
- You have a scratch-built design that looks awesome but would be beyond awesome if you could just put some decals on it – especially if it's a scale model and you want to replicate the real thing as much as possible.
- You built your rocket and used adhesive backed paper decals that promptly peeled and flew off at the last launch and now your rocket looks bare.
- You build your rocket and the decals it came with are fine, but you ruined them for one reason or another, or they were so old and dry they cracked into a zillion pieces when you dipped them in water.

Here is a guide to making your own decals. In this article, I am discussing water transfer decals (the sort you dip in warm water and slide on a surface), rather than the peel-and-stick variety. For rockets, I like water transfer decals better because they are thinner, adhere better and are less likely to peel off over time.

Tools needed

Creating custom decals does not require a whole lot of tools. If you've built rockets already, you will probably have those tools. Here are the typical set of tools used when creating custom decals:

- A sharp hobby knife, like an X-Acto.
- Scissors
- Small paint brush
- A ruler (this is for measuring AND for cutting straight lines)
- A surface to cut on (your knife is going to score it, so don't cut decals on something you care about)
- A laser printer. Get access to one that you can connect to your computer (or someone else's computer). You can't use an inkjet printer because the ink typically runs when it encounters water.
- If you cannot connect your computer to that laser printer, you will need some way to transfer files from one computer to another, like a USB thumb drive
- Word Processor software or an Image Editing application (I use Microsoft Paint)

Consumables needed and where to get them:

- Decal Transfer paper (**Figure 1**). You can get this from a variety of vendors, but I typically buy a ream of 25 sheets or more from eBay. The sheets have a transparent film with a water-soluble adhesive back on the paper. The sheets should be 8.5"x11" paper because you are going to put that paper into a printer.
- Toner: that should be in your laser printer.
- Clear gloss spray lacquer (to give the rocket a gloss surface for any transparent film to blend in with): I prefer the smaller hobby store size,(e.g. from Testors), purchasable from most hobby stores or online hobby vendors.
- Clear matte spray lacquer (to seal the decals after you are done): I prefer the smaller hobby store size (e.g. from Testors), purchasable from most hobby stores or online hobby vendors.
- Any paint you plan to use on your rocket
- A few Q-Tips
- Some paper towels (kitchen paper is best)
- [Optional] Decal Setting Solution (like MicroSol): you can get this from most hobby stores and hobby outlets
- [Optional] Pledge Floor Finish (Gloss): buy this online or at the local grocery/drug store

Figure 1: Here are some sheets of Decal Paper. The silver one is a thicker sheet with permanent adhesive. You can see that the paper is the same size as regular paper.

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Color considerations

The most important step in getting decals on your rocket is preparing the surface. After you have filled in any gaps and sealed the surface, you normally prime and then paint your rocket. That doesn't change. However, after that paint has dried, hit the entire rocket with the Gloss Lacquer. The decal film will show against a matte background and once you use the Gloss, then the excess decal film will disappear in the rest of the gloss surface. After you apply the decals, you can then spray the rocket with Matte Lacquer and the decals will look painted on.

An important consideration is the background color against which your decals will be applied. The decal film, once printed on by the laser printer, becomes opaque but still lets some light (and so some color) through. So, if you put on a background color of white, light red will not completely obscure the underlying white and you might find yourself putting on multiple overlapping decals. By the same token, a really dark color will completely hide a light-colored decal. Depending on the laser printer, you might have to play with the color intensity in your printer settings. I usually like a light white background and bright colors on top, or black. In some cases, I might break up the decals with a bottom "background" decal and then an overlapping decal to provide the necessary contrast.

Getting the Decal image ready

Once you have located an image or pattern you like (**Figure 2**), edit and size it. Print it on regular paper to make sure it's scaled right and fits on your rocket. I find that it helps to cut out the paper version of the decals and test place them on my rocket, or wrap them around the body tube to get a good idea of how they will look (**Figure 6, Page 5**). Go back to the computer and rescale your image as necessary to get your final image. It's an iterative process, but after you've done it a few times you will get the knack of it, and better yet have a library of decals sheets you can keep for other rockets. If you are building a scale model of a rocket, you can figure out the size of your decal by comparing dimensions on a photograph. For example, if in your image, the ship is X mm long and the decal appears as Y mm long, then if your rocket is 400mm long, your decal should be 400X/Y mm long. Do the same for the decal's width and you will have a scale decal (relatively, it's not an absolutely perfect way to do things).

Once you are happy with your decal sheet, save it and give it a name for later reference.

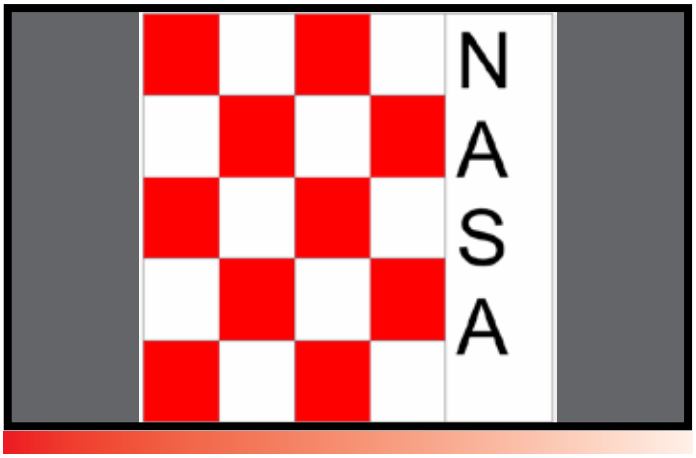

Figure 2: Here's a checkerboard pattern for a BT-55 tube. I set the table to 4.2" (the perimeter of the tube) and simple math tells me the size of the boxes for any number of boxes. Notice the logo on the right added to the same table.

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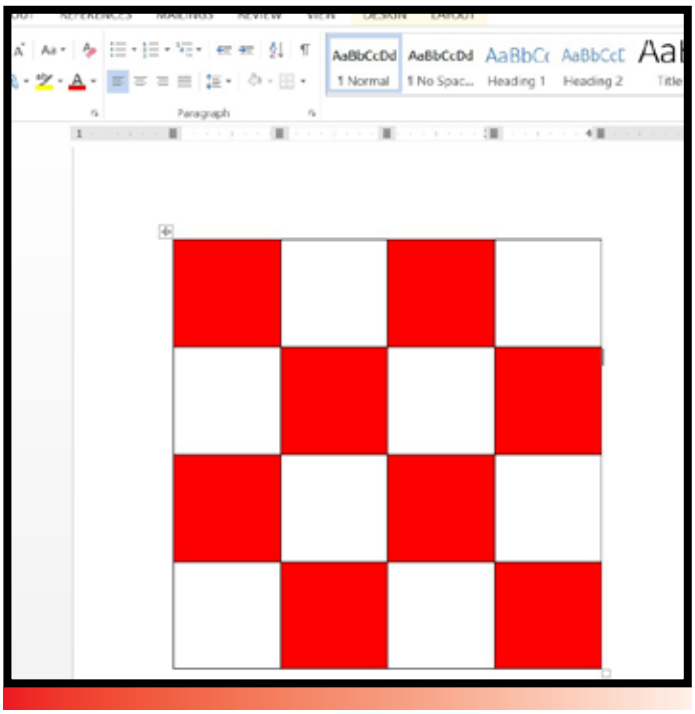

Figure 3: Here's a screenshot of the same decal represented as a table in MS Word.

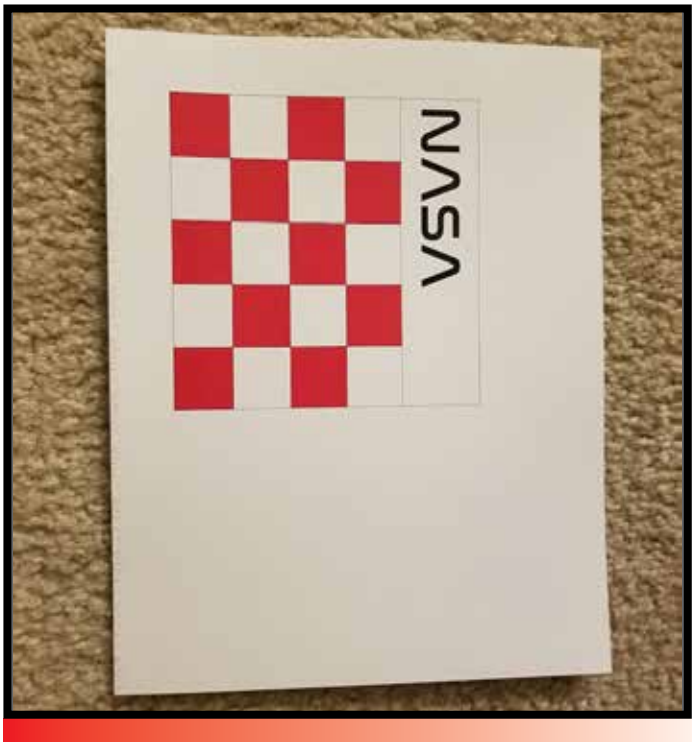

Figure 4: Here is the same decal printed on the decal paper. Make sure you know which side of the paper the printer prints on. Usually the side facing up is the print side.

Cutting out decals

It sounds simple enough, you cut the decals and you are in business. But because you are using decal paper, anything the laser printer doesn't print on is going to be a thin transparent film. You can cut out your decal with scissors and get most of it separate from every other image, but you should next use your knife to cut as close to the edge of the decal image as you can (**Figure 5**). Be careful with curves because if you cut into the decal you will have some trouble getting it to sit on a curved surface with that cut (it will want to stay separated where you cut it).

Cut out decals as you need them, leaving decals on the main sheet until you are ready to apply them.

Figure 5: Here are the decals cut out of the rest of the sheet. Notice that I have cut as close to the edges as I can.

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Figure 6: Here I am test fitting the decal on my rocket. This decal is actually for another rocket, but it clearly wraps nicely around the tube.

Surface Preparation

I've already mentioned priming, painting and the initial Gloss Lacquer layer, but before all that, you have to seal the wood for the fins (if you are using plywood or balsa fins). If you are using plastic fins (e.g. the 3D printed variety), you still need to prime the surface before applying decals. Some plastics have a thin oily coating and even if washed still will provide, at best, a surface with limited adhesion qualities for water transfer decals. I won't go into how to seal tubes and fins as this has been covered elsewhere, but I do highly suggest you do not simply paint wooden fins if you plan to put decals on. Water transfer decals need as much surface area as possible and don't work well when the fin surface might absorb the water on the decal along with its adhesive. This may mean you seal and prime your fins before you mount them to the rocket (I prefer to do this).

If I am planning on putting decals on a transparent part (like a canopy or transparent fin) to simulate an outline like a frame), I would coat the transparent parts in Pledge Floor Finish. This will seal the plastic and give the decals a better surface to bond to. If you want a fancy canopy frame for example, you can do it with strips of decals. Dip the entire part in the Pledge, remove and let dry before you mount it to your rocket. Incidentally, Pledge is a good way to get rid of that super-glue "haze" that afflicts plastic parts. Another part that might be transparent, but could get decals is the transparent body tube section that might have your prospective insect astronaut or camera package. The Pledge will make the transparent plastic much better for optical clarity if your camera lens does not stick out of it.

Applying the decals

Now that the surfaces are all ready and the rocket is all assembled, this is the time to lay down the decals. Dip the decal in a bowl of room temperature water, and let it soak until you feel it loosen from the paper. Do not remove it from the paper and do not let the decal float in the bowl (the paper will separate and sink and when you remove the decal it will fold on itself and get ruined). Pick up small decals with tweezers and larger ones with your fingers. Slide the decal off the paper and into place, positioning it with a small wet paintbrush or your X-Acto knife's tip. When it is in place, blot out any excess water with a Q-Tip (smaller decals), or use a paper towel wrapped around a finger. Smooth out any air bubbles to get the decal to settle down. If the decal is proving difficult, wet it with the paintbrush dipped in MicroSol. That will force it to stretch a little and settle down better, especially on a curved surface.

MicroSol is also great for getting decals to settle down on curves. Remember that you are trying to lay down a flat surface on a curved surface and the larger that curve the more likely you will get a wrinkle. MicroSol will get your decal to stretch just enough to get rid of the wrinkle. Soak the decal with MicroSol using your brush and continue to work the surface of the decal until any wrinkles are gone. Remember that MicroSol will also "eat" the decal if you overdo it, so don't rush. If you are wrapping a decal around a really sharp curve or corner, remember that the decal's shape is important. A fin's leading edge

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means that a wrap-around decal has to have a certain shape. But then, you learned what that shape is when you were trying our decals on regular paper. The MicroSol is going to help the decal wrap around that full 180-degree turn and stay put. Liberally apply MicroSol at the bend of the decal (and everywhere else) to make sure it stays put.

If you have plans of covering a nosecone with a decal remember that it is easier to apply a decal in strips instead of all at once, and then along the length of the nosecone (tip to base) rather than around. By doing discrete strips, you allow each strip to stretch the right amount and when you apply the adjacent strips you can align them so that they fit perfectly. This is actually the same technique I use on some of my Starship models (like saucer sections of a certain famous spaceship). All those compound curves speak to breaking up the decal into smaller elements that line up versus one giant blanket of a decal.

If you do decide to wrap a body tube with something like a checker pattern decal, remember that the shape of the decal is important – if the decal is rectangular with no curvature on the edges then you will need to liberally apply MicroSol to get the wrinkles out as you wrap it around the tube. Work your way slowly, sliding the decal on, aligning it and then dabbing with MicroSol. Then keep sliding off the paper, dabbing with more MicroSol as you go along until you have wrapped the decal all the way around. Dab out any wrinkles with MicroSol either on your brush or using a Q-Tip soaked in it.

I am sure you have also seen “skins” for your rocket that largely eliminate paint (but not the surface prep). Those skins are very specific to a given rocket but there is no reason why you can’t create your own. Just remember to segment the decals so that any one decal goes over as few compound or complex curves as possible.

Sealing

Once your decals are dry, inspect your rocket. This is your last chance to make corrections before sealing the decals onto the rocket. If you find any issues, use a Q-Tip to wet an errant decal to loosen it off the rocket. If it has had a heavy application of MicroSol you might find that it has adhered too well and you may need to scrape it off and replace it. Once you are ready to seal all the decals, it’s time to spray the whole rocket with Matte Clear Lacquer. As with any of these sprays, PLEASE do this outdoors or where you have excellent ventilation. Once dry, inspect the rocket and look for areas you might have missed (they will be glossy) and spray again. Once complete, the decals will look like they were painted on and may outlive the rocket.

Figure 7: Here you can see the decal being transferred onto the rocket. Once it’s on, use a paper towel to blot out any water and straighten out any wrinkles.

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Figure 8: Here is the decal on the rocket, ready for the final steps.

Mylar, a Unique Type of Decal:

There is a type of mylar called "Bare Metal Foil" (**Figure 9**) that is a very thin metallic film with an adhesive backing that is so thin you can apply it around curves (generally with a Q-Tip and toothpick). If you wanted to have silvering, gold, brass or anything in between, this stuff is amazing. If you tear it, you can put in patches and feather them in so that seams disappear. I use it for rocket engine bell housings/nozzles to give them that realistic look. You can also lightly sand the surface to simulate the more weathered look you see on some rockets. I buy it, like a lot of other things, at online hobby outlets. Just search for "Bare Metal Foil". If you want that bare metal look, this stuff is outstanding. As before, prep your rocket, but you would not need the Gloss Lacquer unless you want to apply regular decals over it. Scuff in places to show wear and tear and give your model that scale model look. Just remember that any imperfection will show up very clearly with this covering.

About The Author:

Samer has been building and flying models, including rockets for as long as he can remember and a NAR member for just as long (on and off). You will find him posting articles on building rockets, airplanes, 3D printers, tracked vehicles and other things online. He is a firm believer in DIY and using and re-using whatever he can get his hands on to complete his projects, no matter how long it takes. Look for Samer's projects online and on Google+ as well as on MAKE Magazine's web sites. His most recent 'big' project is a homebuilt flight simulator.

Figure 9: Here's an example of Bare Metal Foil on the bell housing of a static model. Notice how it can show every surface detail. Note, this is NOT the same as the silvered decal paper in *Figure 1*, it is far thinner.

Figure 10: Author Samer Najia