Scratchbuilding Part 1

Planning, Materials and Cutting Plastic

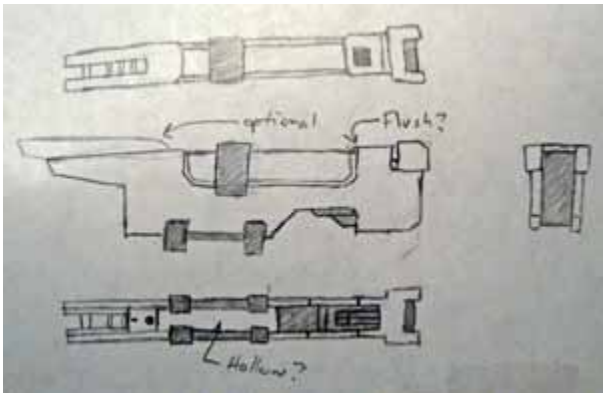
I want to share some of my scratcbuilding techniques since I recently organized what I knew for a presentation at one of Gamerabaenre's build gatherings. I'll cover my basic techniques, which I think should work for anything from a simple modification to a fully scratch-built project. It's really lengthy, but I wanted to present it in a nuts-and-bolts way so it would be helpful to as many people as possible.

Research

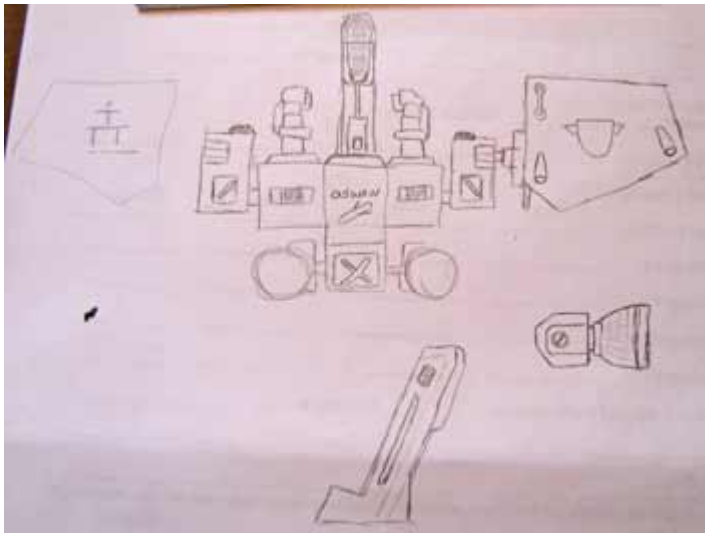
I start with research, and often do more research as the project progresses. Whether you are trying to replicate something else or trying to make your own design, I think it's really important to look at a lot of images. I probably gather even more images for my own designs than for copying somebody else's since what I want to do is find several designs with the right "feel" for what I want to make, and then look at what kind of shapes and surface details gives the design that feel so I can capture it in what I am making.

Sketching

The next thing I do is a make concept sketch of what I want my design to look like. Even if I'm making somebody else's design, like the HRUDUDU parts and sniper rifle I made for my Hazels, I'll make a sketch so that I can put all the details together and draw little arrows to make sure I capture a particular detail.

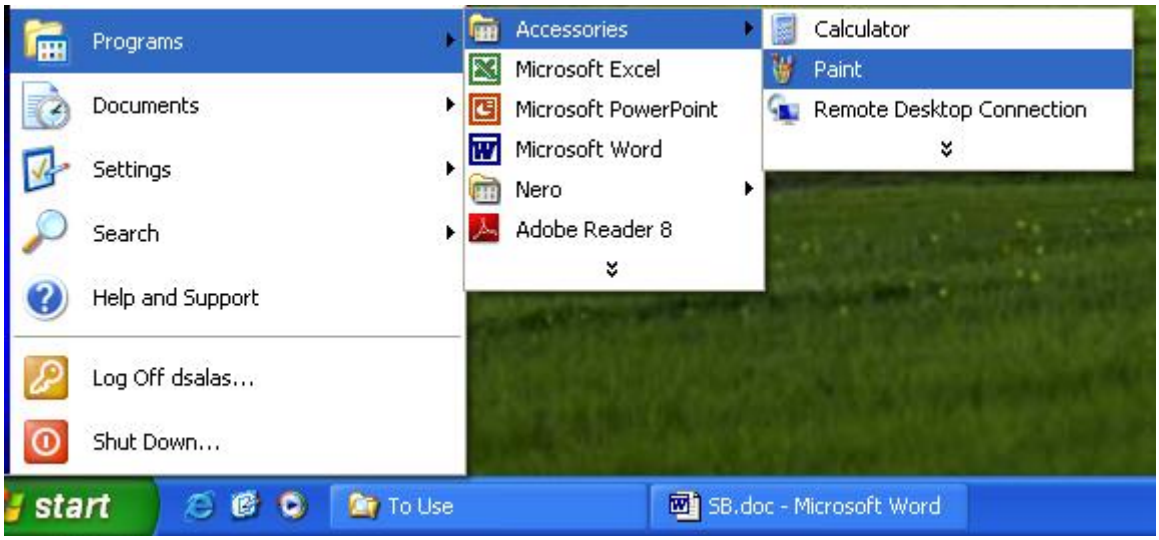


I may do a second round of sketches for a scratchbuilt part when I get to surface detailing to help me sort out what details should go where. This helps me not over-detail or under-detail.



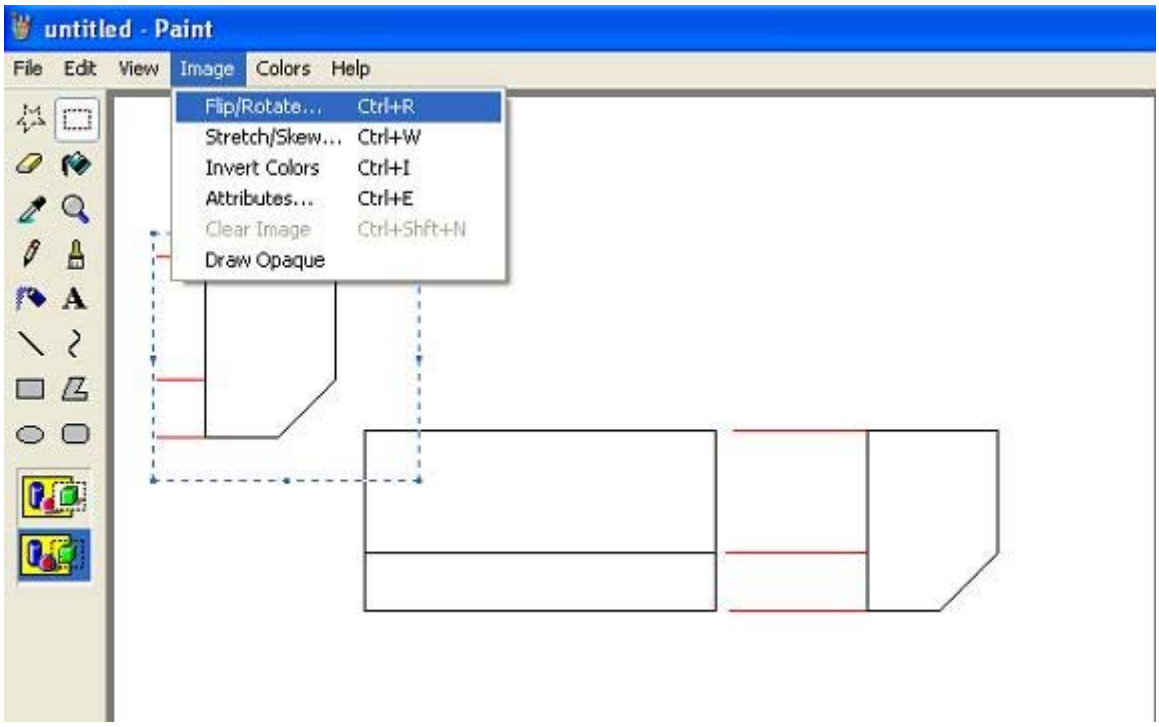
Adobe Illustrator / Corel Draw / MS Paint

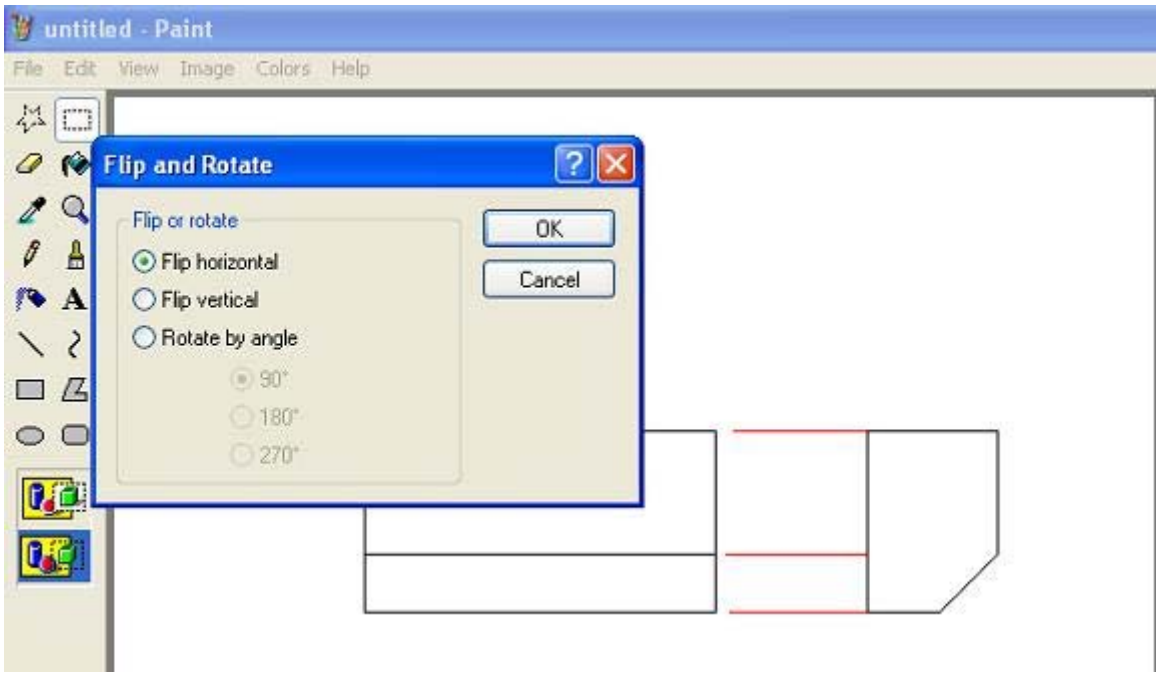
I'll often draw something on my computer. I don't have Illustrator, but I have Corel Draw, a similar program. Sometimes, I even use MS Paint, the simple program that comes with any PC (Find it under Programs/Accessories/Paint).

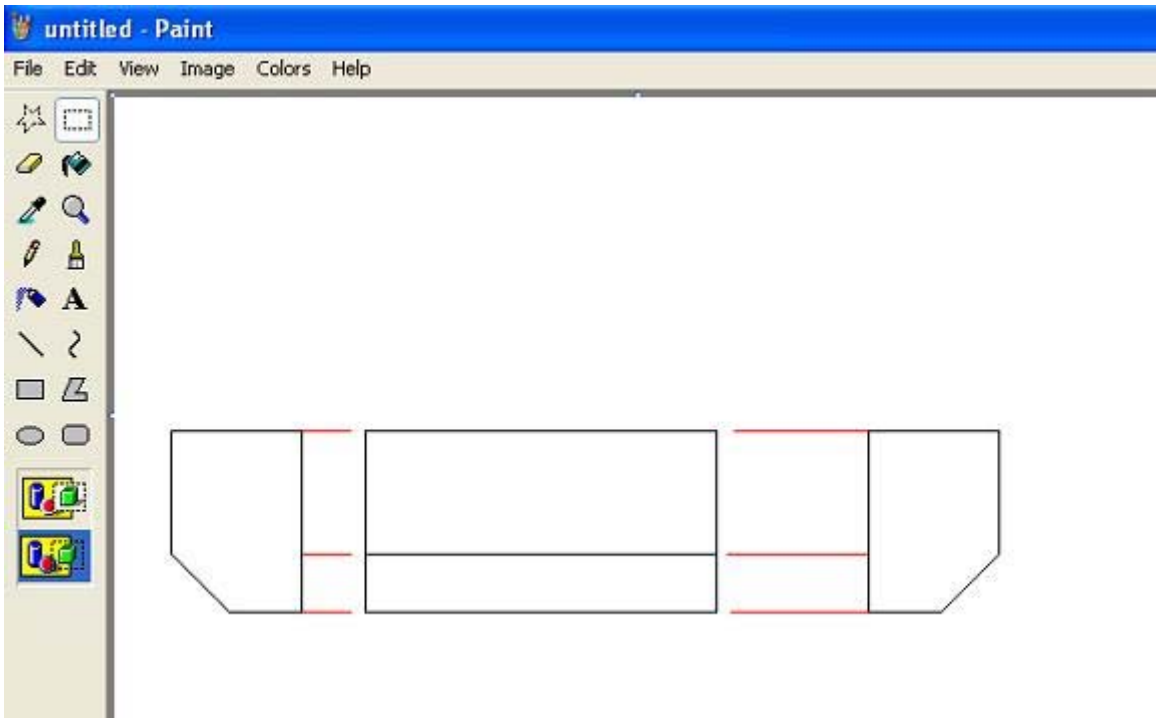


What I'm essentially doing is computer-aided drafting to make a blueprint that I can use to cut out plastic. Using a PC gives you straight lines and it's easy to make symmetrical shapes by flipping the image horizontally or vertically. In Paint, use the image menu and choose flip/rotate. Another good thing is the ability to use guidelines. In paint or illustrator you can add them and move them around in the background and they won't show up when you print. In Paint, you just have to draw a line (I change the color to red so it doesn't get confusing). You can make sure the line is level by holding shift while you draw it; this forces the line to draw in 45-degree angle increments.

Using guidelines helps you draw the sides of something. Draw the front view. Draw guidelines along the top and bottom. Draw the side view next to the front view using the guidelines to make it the right height.







As far as a comparison, the upside of using Draw (or Illustrator, I assume) is that it has a very accurate ruler so that if I draw to specific measurements, what I print out is exactly that size. The downside is that it has a much bigger learning curve and doesn't lend itself to quick renderings. Oh yeah, and it costs money.

Before I got more comfortable with Draw, I used MS Paint. The way to work around the ruler limitation is to draw what you want and then save it and open it in Publisher, PowerPoint or Word (in that order of best to worst) and make several copies of it at 5% or 10% size intervals (like 85%, 90%, 95%, 100%, 105%, 110%) and then print it out. I can then put it up to the existing parts of my model and decide which is best.

Once I have this print out, I'll cut it out leaving about ¼" of paper around it, tape it to a plastic sheet and cut along the lines.

Plastic Sheets

I use evergreen plastic. It's not available at every hobby store, but there are a couple in my area, like Brookhurst Hobbies and The Toy Train Shop. Evergreen really caters to model railroad builders, so try a hobby shop that specializes in railroad stuff. You can also check the Evergreen website for a local retailer, although I've found their list is not complete.

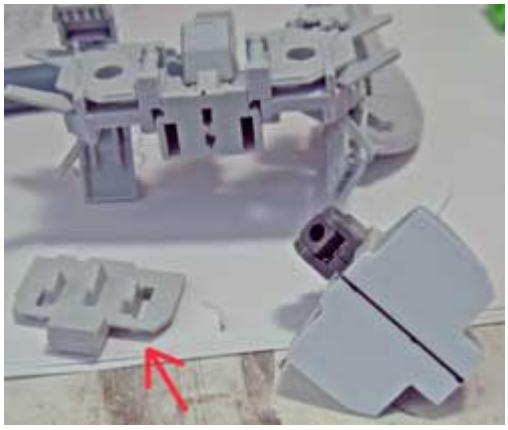
Evergreen makes both sheets and rods/tubes (rods and tubes being not only round, but also square and rectangular). The sheets I use are .010, .015, .020 .030 and .040. Evergreen also makes textures sheets with fine corrugations that are good for filling in vents and rectangular thrusters.

I used a piece of textured Evergreen sheet to create the texture inside the exhaust vent on the binder on the backpack on my GAU:

Metal Ruler

I like to measure using a metal ruler. Metal is good because you can run your X-Acto blade along it without fear of gouging the ruler. Nothing makes a better straight line than a metal ruler. The ruler I use is marked on both edges of both side and measure metric and standard down to 1/32”. One of the edges has a center-finding feature where 0 is in the center of the ruler (where 6” normally is) and the measurements go out in either direction from there. So, if you need to mark the center of something (which I do all the time), you place the ruler on the piece you want to measure and slide it until the measurement on either side of the ruler is equal.

I drew the centerline on the irregularly-shaped piece on the lower right using my center-finding ruler:



Cutting Sheet

My favorite tool for cutting plastic sheet is actually a good pair of household scissors. Many people suggest putting a ruler on your plastic and scoring it multiple times with an X-Acto blade and snapping the plastic. I have several reasons why I think this ***isn't*** the best way to go:

1. The X-Acto knife approach takes too damn long. Seriously. I only use it when I'm cutting plastic too thick to reasonably cut with scissors.
2. X-acto knives are only good for one straight line at a time. If I'm cutting out a polygon (which I usually am, a rectangle for instance), then I have to carefully align my ruler and score, score, score and snap, then carefully align my ruler and score, score, score and snap, then carefully align my ruler and score score, score, and snap, then carefully align my ruler and score, score, score and snap. With the scissors it's snip snip, snip, snip done.
3. Rulers are no good on curves.
4. If I already designed my shape on the PC, I've got straight lines already printed out, I'm a grown up, I can cut a straight line with a pair of scissors.
5. Plastic is flexible, so no matter how straight you cut it, once you put it together in 3D, there are most likely going to be small warps and imperfections anyways. Cutting with scissors may warp the plastic even worse, so when you're done cutting bend it back into shape.
6. The bastard file makes near-straight lines straight and if that doesn't do it, CA glue or putty will (see below).
7. It's true that cutting with scissors leaves a tiny jagged edge on the plastic. So does snapping the plastic (the part you snap will have a rough edge). And remember, when you scratchbuild, every edge is a seam. You're gonna putty the heck out of the scratchbuilt parts of your model, so I don't really sweat the rough edges unless they will be exposed.
8. Since any two pieces I cut out are invariably a little bit different, I stack them and go over the edges with my bastard file until they are perfect copies. This will remove much of the above jagged edge.

One thing I do a lot when cutting out is to cut out one piece and use it as a template to trace the other identical pieces I need. Keep in mind when you cut out the copies to cut about 1 mm INSIDE the lines to make up for the fact that your traced shape is always fatter than the original. As I said above, when they're cut out, I stack them and trim or file off the excess until they match.

To summarize … I totally believe in measuring twice and cutting once, but I also believe in Murphy's Law. In my experience you can really overdo it worrying about perfect straight lines and angles. No matter how hard you try, it isn't going to be perfect.

I try to remember that the brain is a pattern-recognizing machine. If you build a 95% perfect cube, people will SEE a cube and marvel at your scratchbuilding prowess. The thruster legs on my Hazel hummingbird are NOT

symmetrical, and they're RIGHT NEXT TO EACH OTHER. I screwed up on the shoulder mounts on my Gigantic Arm Unit; one is 1/16" thicker than the other. I didn't even notice until I was practically done with my model, and I don't think anybody else ever has. The only person who would know is that guy that goes over a model with a pair of calipers, and that guy is a douchebag.

Scratchbuilding Part 2

Building a Box

Building a Box

If you're not building something with round organic shapes, then the heart of most mechanical designs is a box. It may have a facet or two so that in profile it's actually a pentagon or hexagon, and it may not have 90-degree angles and be a trapezoid, but it's still easier to think of it as a box.

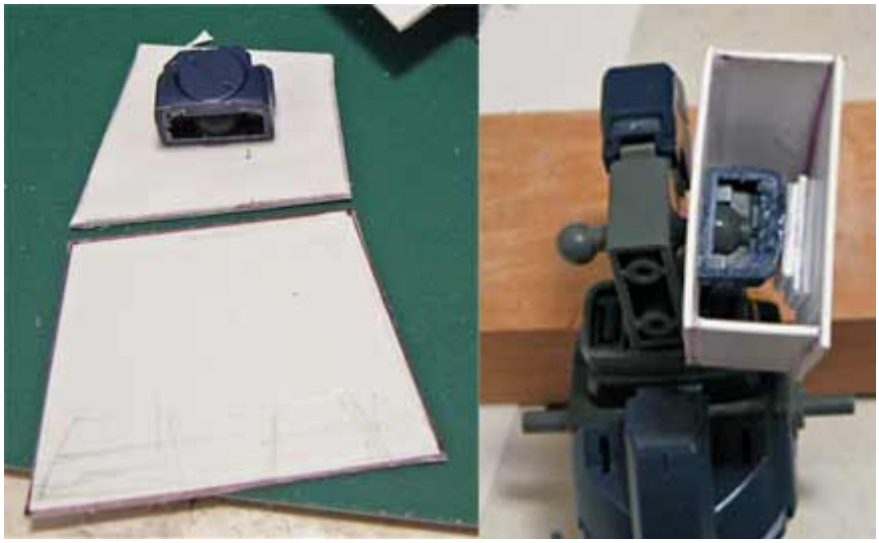
The thruster legs on my Hazel Hummingbird started their lives as two simple boxes:

I built another box below them:

I used different sized plate to build a box. Thicker plastic is stronger, and can be beveled more, but thinner plastic is easier to cut and sand. I like to build my boxes with a mixture of plates.

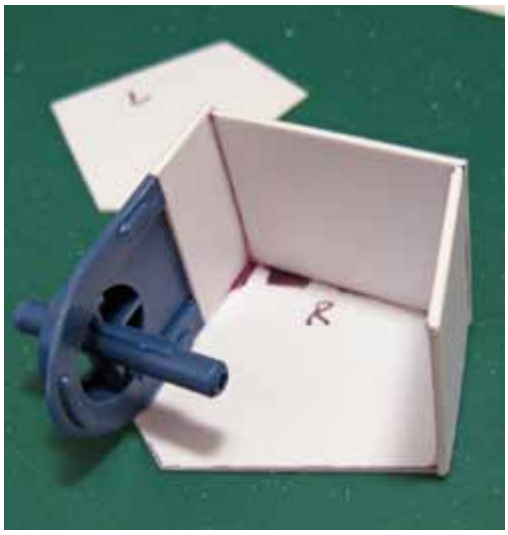
.040 sheet is the thickest I use. It is resistant to flexing on the scale we're likely to build at, but being thicker, it's harder to cut and sand. I'll often use .020 plastic for the thickest wall. So, if I'm building a box that has six sides, I'll do at least 1 side with the .020 and then the two opposite sides that touch it in either .020 or .015, and then simply sheet the other three sides with the easier to work with .010, since the three thicker sides will give the box enough strength.

In the left picture, you can see the two base pieces for the thruster legs of my Hazel Hummingbird; in the right picture you can see how I built the top box around the top of the thigh of the Hazel so I could use its polycap. I built up a plastic shim to fill in the blank space between the thigh and outer wall to make it stronger so I wouldn't have to worry about breaking it when I popped the leg onto the hip ball:



Before you close it up, remember that if your box needs polycaps or magnets or lights of batteries inside it, now's the time to figure out how you're gonna do it. I'll talk about mounting polycaps later.

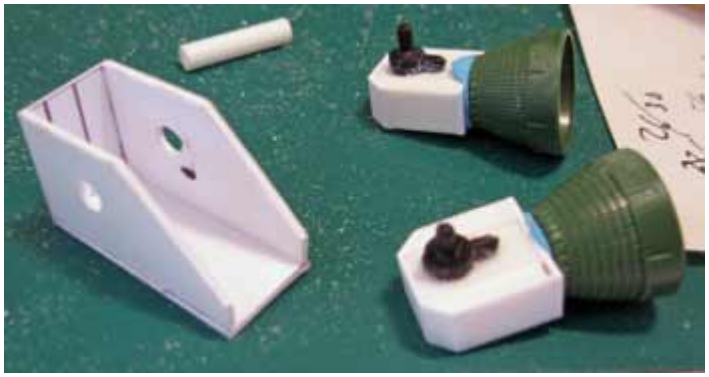
I built this "box" (the shoulders for my Gigantic Arm Unit Hazel) around a shoulder piece from the HGUC Zeong kit:



So, when I build a box, I'm really only worried about three sides of it. You could call one side the base; it's the largest side in area and should be made of the thicker plastic you are using. Lay it flat on your building surface and get two more sides (sides that touch the base side, but are OPPOSITE each other) of your box to glue onto it. Find something with a 90-degree angle. I use the corner of my metal ruler. Take one side, put medium CA glue on the edge that will touch the base and put it on the base, looking to see that the edge of your side lines up straight with the edge of the base. Then, butt your 90-degree object up to the side and make sure it sticks straight up 90 degrees. Before the glue dries, check once more that the side hasn't slid around and that it's still lined up with the edge of the base. Now do the same with the third side.

Now you have three of the six (or seven or eight) sides of your box. Since this is the core of the strength of your box, you may want to strengthen it with a glue gusset. Run a bead of medium CA glue on the INSIDE edges of the box. Add a drop of Accelerator to harden it. This makes your glue joint much stronger and provides a bit of insurance in case you go crazy beveling later.

Here's a shot of the bottom of the GAU's backpack that shows it with 4 sides of the box attached. I had stopped at this point to glue in the tube that would hold the balls for the polycaps in the other pieces. I drilled the holes before *putting the pieces together by stacking them and drilling one hole through both to ensure alignment:*



You can build the rest of the box without a single measurement. Take your three-sided box and put it on top of your plastic sheet with an empty side facing down. Trace the three sides that touch the sheet, making a reference mark where the sides end in open space. Draw a line connecting your two reference marks and cut out the rectangle shape you've drawn.

Glue this to your three-sided box, lining up two edges, one should be your base side and the other should be either of the side walls. When I do this, I like to lay the box on its base on my workbench so that if I push down on the new side I am gluing on, I get it flush with the edge that touches the base.

The third edge of the new sheet you are adding will likely hang over on of your existing sides a bit, and the last edge will hang out over empty space. Use your scissors to trim the overhang over the existing side of the box and use a bastard file to get it flush with the side. You can use it on all of the edges for that matter, in case they aren't perfect.

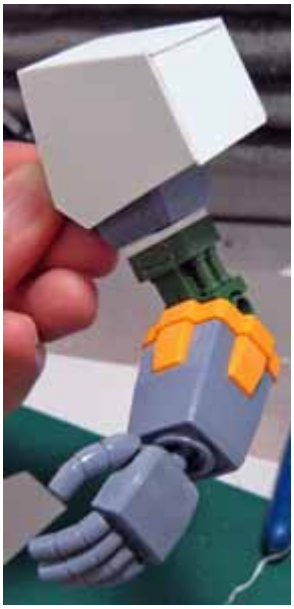
You now have a four-sided box. Repeat the above to add a fifth side to your box, opposite to the one you just added. Before you add the last piece and close the box, add glue gussets as you see necessary.

You now only have one side to add. Two of the sides you will glue the last side onto will be perfect, because they were among the first sides you made, and they were measured and filed to match. The other two sides will be close, but not quite perfect. If your box isn't too big, you can just take the scissors to them and knock off the excess in one careful snip. If your box is big, you may want to put a ruler across it, touching the good sides on either end and mark off a straight line to reference as you cut.

Then use your bastard file to get them flush. Check the fit by putting the box open-side-down on a flat sheet and making sure that it sits flat, without a raised corner. It's OK if there are small gaps, we can fill those, you just don't want your final wall to look crooked. It will probably help once you get close to go ahead and trace the shape of your last wall and cut it out.

Once your box is all glued together, trim off the excess and file the edges flush.

Here's the GAU shoulder just after gluing, you can see the edges are still rough:



The Bastard File

Okay, I've already mentioned it, but as you can see I use a bastard file A LOT. Fichtenfoo turned me on to this, he calls it his secret weapon and I totally agree. Sandpaper and sanding sticks and even sanding bars just don't cut it. A Bastard file is like a 3D ruler; it makes great straight lines because it's long, flat and unyielding. It doesn't wear out like sandpaper, and as long as you make smooth strokes with it, it actually leaves a pretty smooth surface.

To get the most out of it, file long-ways or at a diagonal so that the ends of the file or at least a good part of it is going over the good surface you are trying to get flush with.

Sanding Sticks

I don't like buying nail files for my models. They're too big and I'm too cheap. I buy sheets 320-grit sandpaper from Home Depot and popsicle sticks from a craft store like Michaels and make my own.

A quick note, if you're used to the spongy sanding pads, their grit grading is not the same as regular sandpaper. I find that the 150-grit sanding pads are about equal to the 320-grit sandpaper.

On the back of the sheet of sandpaper, measure to the end of your popsicle stick and draw a line lengthwise. You can cut this piece off and wrap one end around the popsicle stick 3 times and mark that length. Measure that length and then cut the rest of the piece of sandpaper to strips that size. Now just glue the sandpaper onto the stick and you've got a cheap (and smaller) sanding stick.

For the sticks I use, the right measurements are 1¼ inch by 4½ inches. I have no idea if popsicle sticks are all the same size.

Scratchbuilding Part 3

Making Things Smooth, Beveling and Panel Lines

Making The Box Smooth Part 1 – CA glue

Before I add surface detail to the box, I want to fix any seams on it and make it smooth first. It might seem like a pain to do this twice, once for the basic box structure and again for any details you add to it, but keep in mind

that it’s really easy to sand a box with no surface detail. If you add the details and then sand it, you’re gonna go nuts sanding in tiny bits around all the surface detail.

Here’s a pic of the HH Thruster Legs after detailing, notice the details are ON TOP of a layer of putty. I smoothed out the basic boxes before adding details:

I fix gaps, seams and other surface imperfections in three steps. The first is with medium CA (super) glue and accelerator (kicker). I use this to fill gaps up to about 1/16”. If you have such a big gap you may want to plug it up part way with a scrap of plastic.

To fill the gap, put some CA glue in it, wipe it smooth, if necessary. You can use your finger or a piece of plastic, or save some of the clear plastic bag your kits come in. This is just to take off excess and save sanding.

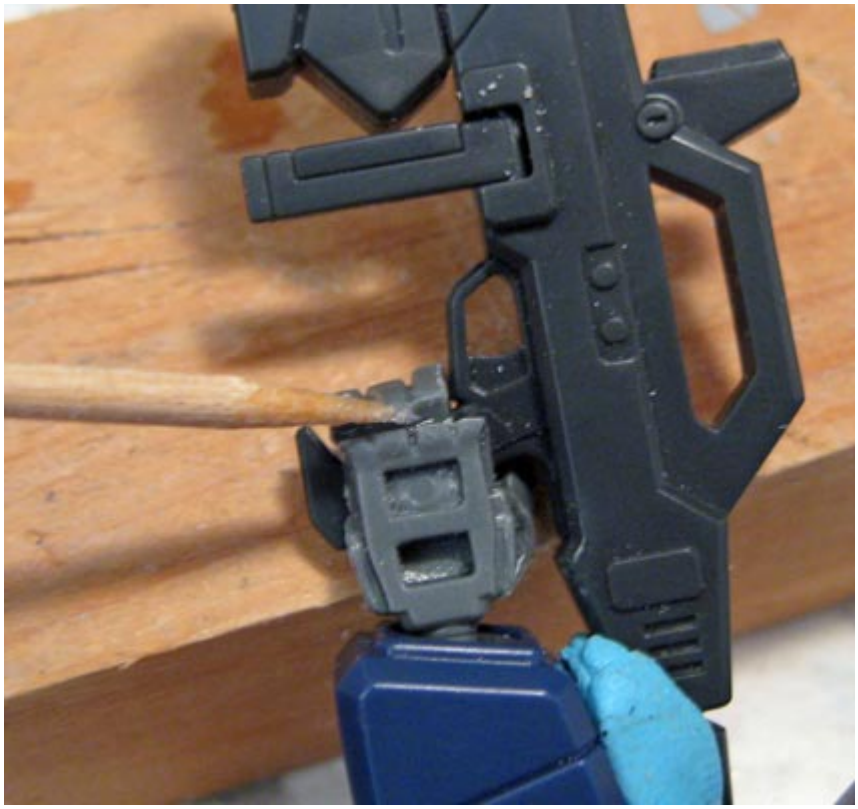
I then drip accelerator onto the glue. Most accelerators come in spray bottles, but that's because they're meant to be used on R/C planes that are 100 times bigger than our models. I unscrew the spray cap, and drip accelerator from the end of the pick-up line. After a few seconds, once the glue has solidified, I wipe off the excess accelerator.

The reason you use accelerator is not just to save time, but to “freeze” the glue in place. If you were to let it dry, it would slowly seep and settle until it no longer filled the gap. You may have to apply two or three rounds of glue until you build it enough to fill in the area you want.

CA ends up with the consistency of plastic and I sand and shape it both with the bastard file and sandpaper.

Here's a big gap in the modified left hand of one of my Hazels:

In this case I applied CA glue with a toothpick to fill the gap:



I apply accelerator with the bottom of the spray nozzle drawtube:

It hardens more or less instantly:

And I sand it:

Making The Box Smooth Part 2 – Bondo Glaze and Spot Putty

The next thing I use is Bondo Glaze and Spot Putty. It substitutes fro Squadron Green or White Putty. I think it’s better because it comes out of the tube thinner than the Squadron stuff, and is easier to sand. Even though it’s thin, for some applications you might also thin it with cheap testor’s liquid model glue o that you can brush it onto the model.

Here's the modified crest on my HGUC Sazabi with a bunch of brick-colored Bondo putty on it:

I like to use a thicker putty like this because I can kind of spread it all over. You could do the same with CA, I guess, but it seems like a waste of a lot of glue, I think it would take a lot longer to put on since you'd have to keep hitting it with accelerator and also CA glue is much harder to sand. The advantage it has over Mr. Surfacer is that it fills a decent-sized seam, and Mr. Surfacer really doesn't. I don't count on Mr. Surfacer to handle anything bigger than a panel line.

I sand Bondo putty with a sanding stick.

One other note – I haven't got around to trying Tamiya putty. It probably comes out smoother than Bondo, but I haven't got around to buying it yet…

Making The Box Smooth Part 3 – Mr. Surfacer 500

The big drawback to both Bondo and Squadron putties is that they have a gritty texture that will most likely show through when painted. This is why after I sand it down; I coat it with Mr. Surfacer 500. Mr. Surfacer can also fill small scratches and very small seam lines.

After sanding the Bondo, I "painted" over the area with Mr. Surfacer 500:

The best part about Mr. Surfacer is it's very fine texture that sands smoother than plastic. It also "feathers" really well, blending a surface that's slightly raised with the flush surface next to it. Once I've sanded down the Mr. Surfacer, the box is ready for surface detailing.

Beveling

One of the most basic but important things you can do with your scratchbuilt part to help make it *not* look like a plastic box is to bevel the edges. If you look at your models, most of the edges are beveled.

To bevel the edges and get them to look even, I first mark them with the side of a Sharpie marker. I then start in with my bastard file, trying to hold it a consistent angle. As you file, a white stripe will appear in the black edge. Just file until that white strip is consistent and as wide as you think looks good.

Here's a shot of the GAU Backpack where you can see some of the sharpie marks and beveling:

Panel Lines

I'm pretty new to panel lines. I've used two methods. The first is simple and works for straight lines on flat surfaces, and that is to lay a metal ruler down and score the plastic with an X-Acto knife, making two or three light shallow passes. Then turn the X-Acto knife around and run it through the line you've made with the dull side to widen and deepen the groove.

When I wanted to add panel lines to my Sazabi, with its compound curves, I knew I would have to try the Dymo tape method with a sewing needle help in a pinvise. Straight lines with Dymo tape are easy, just stick the tape to the model where you want the line to go and use the edge up the tape to guide the needle as you make your panel line.

When trying to make lines parallel to a curved edge and over a curved surface, I had to do more work. What I did was to start by laying Tamiya masking tape over the area I wanted the panel line to go. I would then fold the tape over the edge I wanted my panel line to run parallel to. To mark that edge, I would rub the side of my Sharpie along the edge. Then, once I took the tape off, I would have a 2D shape that matched the 3D contour.

I'd then use that line to measure from, making a bunch of dots the same distance away from it. Then I would free-hand a line using the dots as a reference. Then you stick the Tamiya tape to the Dymo tape and cut along the line with an X-Acto knife. Now you should have a piece of Dymo tape with a curvy edge that is parallel to the surface you want to draw a panel line to.

If you have a piece to do on the other side of the model, then pull the Tamiya tape off the Dymo tape, stick it to the back of the Dymo tape (the covered up sticky side) and cut your shape again. Then you can make a right side and left side without having to do the whole process all over again.

No matter what method you used, trying to press hard and make your lines in one or two passes is going to result in slips that gouge your plastic and your fingers. Mistakes are inevitable, but you'll get better results with many light passes.

Another issue is that making these lines always pushed the plastic on the edges up so that you have a bump with a panel line in the middle of it. You can sand them off, but you can save yourself a lot of sanding by first shaving the edges off with the side of your X-Acto knife, then sanding what is left smooth.

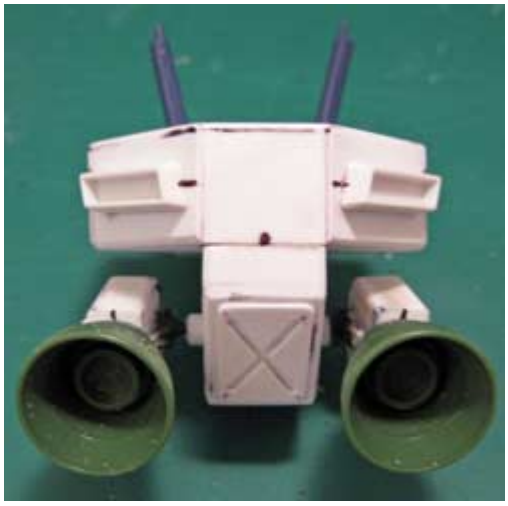
Scratchbuilding Part 4

Detailing Scratchbuilt Parts

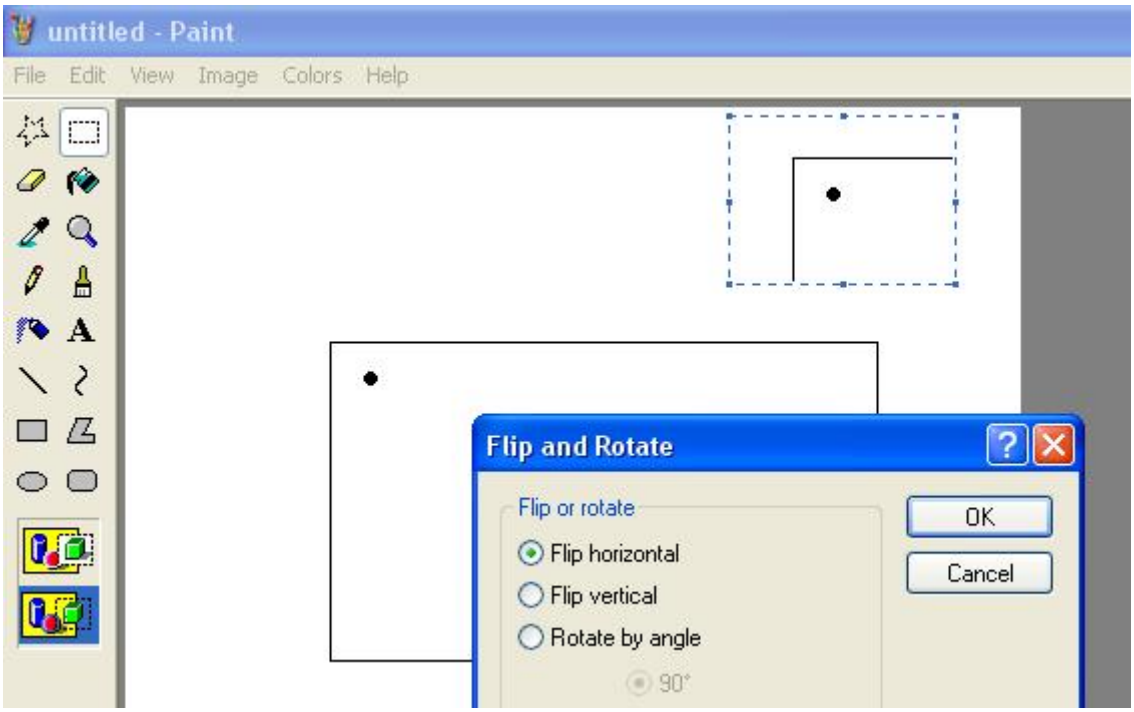
X-Panels

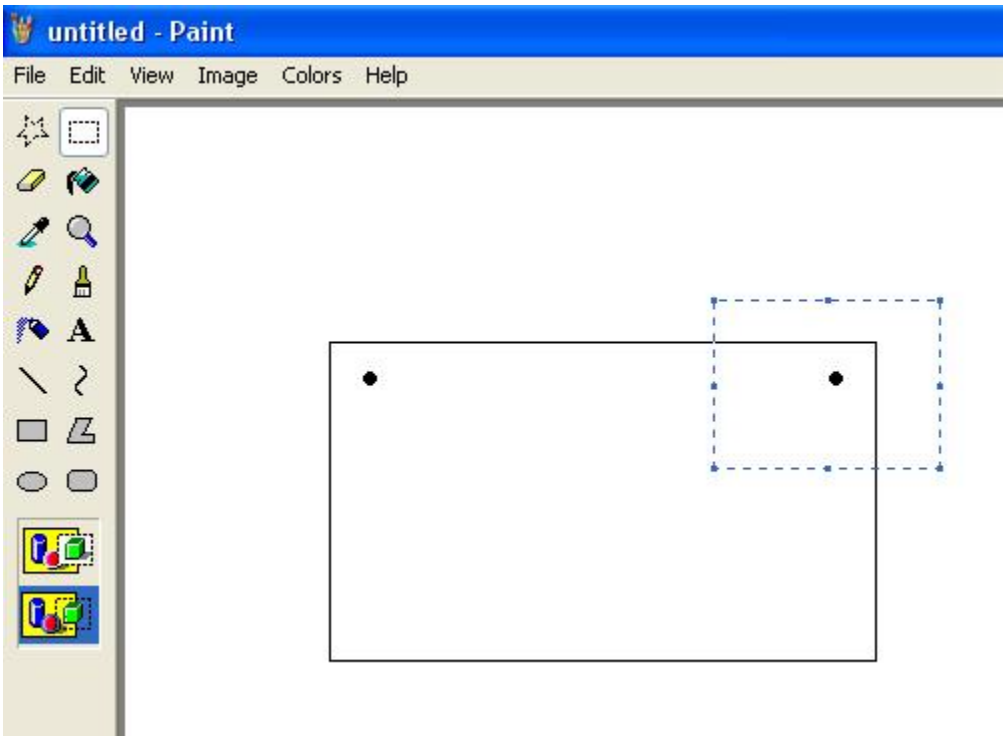
Another way I add surface detail is to add thin plaplate panels to the surface of the model. These can represent hatches, access panels or add-on armor. A way to make them more interesting is to cut out an X or even just a diagonal line in them.

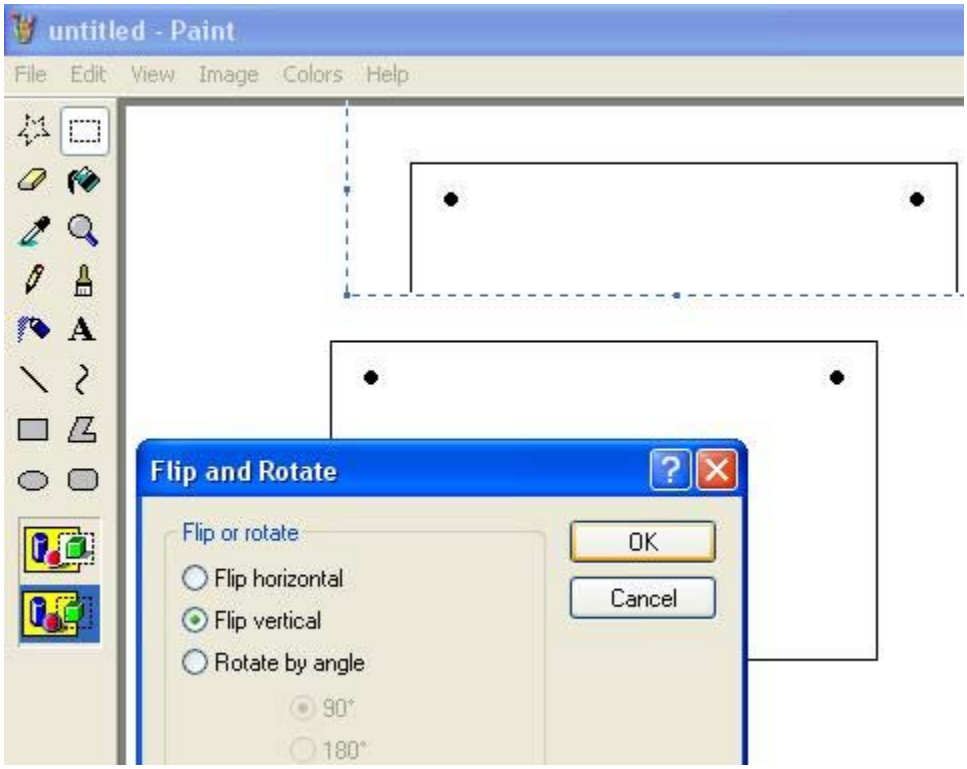
I used an X-panel to fill in a flat, boring part on the bottom of the GAU's backpack:

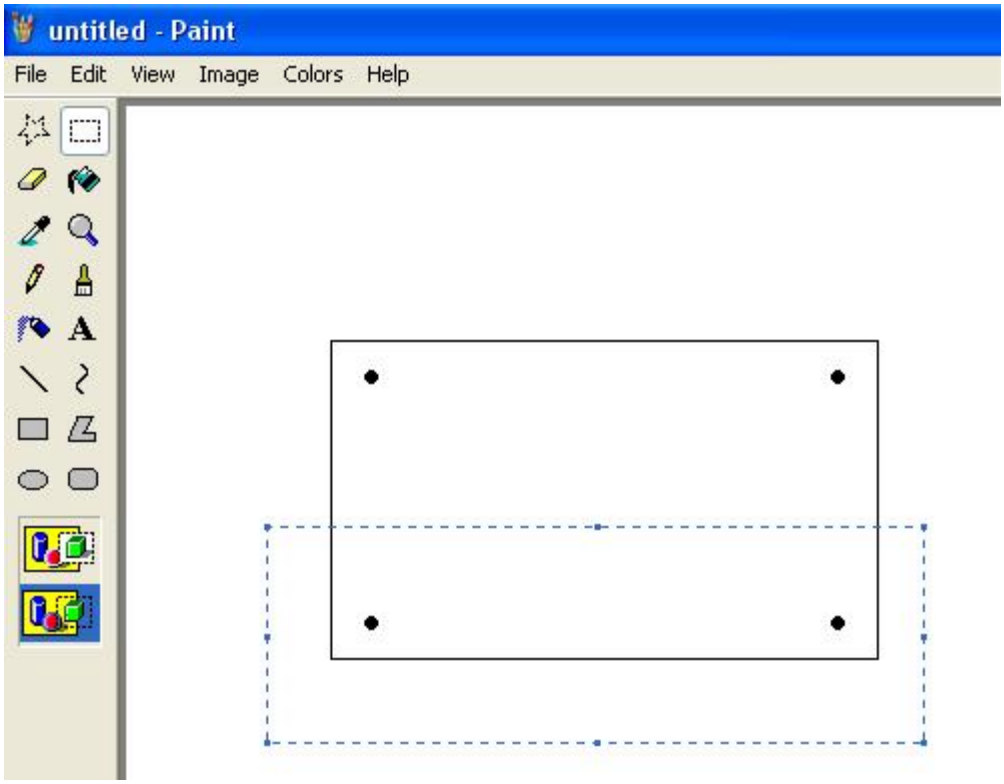


Start by cutting out the panel to the size that you want it. Sometimes I create a template for the panel on my PC and print it out, and sometimes I just wing it. Either way you need to mark 4 dots at the corners that will anchor your lines.




untitled - Paint
File Edit View Image Colors Help


untitled - Paint
File Edit View Image Colors Help
Flip and Rotate
Flip or rotate
Flip horizontal
Flip vertical
Rotate by angle
90°
180°
OK
Cancel



If you make a template for the panel on your PC, the easiest way to do it is to place a dot where it looks good in one corner, copy the whole panel shape and then flip the copy horizontally. Lay the copy over the original and now you have two dots in two corners. Copy that and then flip it vertically and then you'll have all four. If your shape is not symmetrical it may be a little harder to do, and you may try the "wing it" method below.

If I don't design it first on my PC, then I'll start by making my plate to fill the area on the model I want to add detail to. I then lay my ruler across the plate diagonally and draw a line from one corner to the opposite corner. If you want an X, draw a line across the other diagonal. Then draw a dot along the line near one of the corners, wherever it looks good. Measure the distance from the dot to the corner, and the place a dot at each corner using that measurement.

Choose a small drill bit with a diameter that is the same as you would like the thickness of the line you are going to cut out to be. Drill four holes on the dots you just drew with a pinvise. Then place your metal rule so that it connects the outside of the circle at one end of your plate with the corresponding outer edge of the circle at the opposite end of the plate. Cut a line carefully with a SHARP fresh X-Acto blade. Now cut a line that connects the opposite edges of the circle. A strip of plastic should now fall out of your plate and you should have a long line with nice rounded ends in the plate. Use a thin flat jeweler's file to clean it up so that the line flows smoothly into the holes you drilled.

Detailing Bits

Finally, small bits of detail are required. I have five main sources of small details that I use both to make scratchbuilt parts more realistic, and to add small details to otherwise stock kits.

Koto Parts

Kotobukiya makes a line of "Modeling Support Goods" from number KBP100 to KBP137. These are small plastic pieces molded in all kinds of shapes. Wave also makes parts like this, but in a smaller variety. Here is a

link to a search results page with their option parts, as well as a list of the sets I have in my stash. I put stars by what I think are the real essential types:

Hobbylink Japan Koto Parts List

KBYP-101 *
KBYP-103
KBYP-104 *
KBYP-111 *
KBYP-113 *
KBYP-116 *
KBYP-119
KBYP-123
KBYP-124 *
KBYP-126
KBYP-130
KBYP-134

Here's a close-up of some detailing work on my HH. There are 4 Koto option parts (dark gray), a small piece of Evergreen strip, a handle piece from an older MG kit (mentioned below), and a plate with a diagonal slot, created the same way as an X-panel:

These Koto parts are very easy to use, but hard to get a hold of. I haven't found any US dealers that consistently have these parts. I get them either from Hobbylink Japan or Rainbow 10. In Hobbylink Japan, search for them in advanced search by setting the Product Type field to "Option Kits" and narrow the search by setting the Company to Kotobukiya. Wave also has option kits. You can also not specify the company and see all kinds of stuff. In Rainbow 10, the option parts are listed in "Today's Stock List" under "Color paints & Tool".

It seems even in Japan, the popular sets are hard to come by. Every year or two they shoot a new batch. I've tried to order many different types at a time in a big, economical order, but when I did that, the stock would fluctuate, I would wait a LONG time, and I'd still only get a part of my order anyway.

I contacted HLJ, and they advised that the best way to get these parts is just to suck it up and order them in small orders, as they are available. Fortunately the shipping for a small box full of 10 or 20 of these little sets is only around $5. When a few good sets that I want become available, I order them, and order 2-4 of each set, depending on how much I think I can use them, and I build slow. ORDER MULTIPLE SETS! You don't know when they'll be in-stock again, so buy what you think will be at least a year's supply.

MG Kit Parts
Another place to get small plastic detailing pieces is from the older MG kits. The first Zakus, GMs and Gundams came with little vents, hooks and handles that are quite handy. I think they were pretty common in kits up to the 08th MS Team lineup. You can check out the parts runners on Dalong. Obviously, any time a kit has unused parts, keep them, and if you retire an old kit, strip it of thrusters and weapons and things like that before you stick that M80 on it. One of my favorite kits is the MG FAZZ Sentinel. Not only is it a cool MS, but the kit has tons of extra parts that I've used throughout my various projects.

Evergreen Plastic Strips
Evergreen makes very small plastic strips both in flat and half-round shapes, and these parts can be cut into little pieces and add great detail to a model. Some of the small strip sizes I use are .010 x .030, .015 x .060, and .020 x .100. I also have small .060 half-round strips.

The detail on the top of the barrel of the sniper rifle on my HH is little bits of Evergreen strip. This picture also shows the handles from an old MG kit on the thruster legs really well:

You can also use strips to replicate the slats inside of vents, like I did here on the bottom of the sniper rifle:

Metal Bits
Third, I use metal bits from Mecha Skunk. I get by with 1mm tube beads, 2mm tube beads and 1 mm balls. I also bought the corresponding drill bits he sells for those parts. Just drill the hole and stick the piece in. Generally, I don't use glue, friction is usually enough to hold the piece in. If I do use glue, I use Elmer's white glue since it dries clear. I also use Elmer's for transparent pieces.

Many other companies like Ako Hobby and Adler's Nest sell metal detailing parts. Keep in mind that a good metallic paint like Alclad can make a plastic piece look convincingly like metal. I only buy metal pieces when plastic really won't work, or the piece is too tiny to make from plastic.

Here are some examples of metal pieces used in my models:
I used 2mm tube beads for the chest guns, 1mm tube beads for the head vulcans and at the bottoms of the shoulders, and 1mm beads on the top of the shoulders, on the sides of the shoulder thrusters, and inside the triangle panels below the vents:

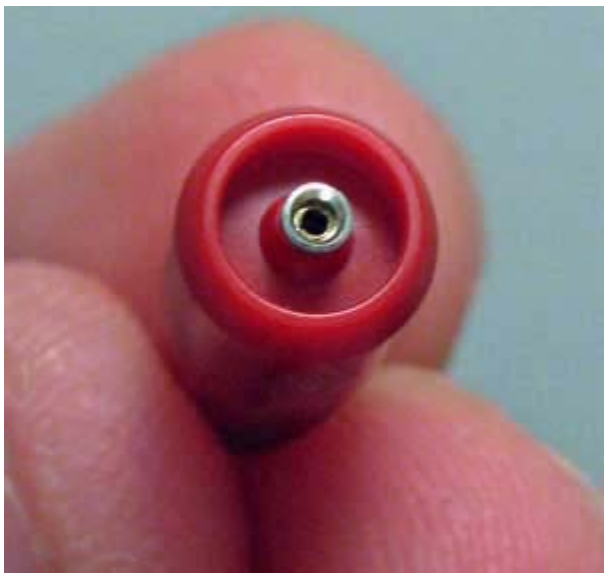
I used 1mm balls to simulate rivets on the darker portions of the MS stand that the top of my GP01 sits on. Also, I used several round beads on the background; you can see 2 next to the AE logo.

IC Pins
Finally, I use IC (Integrated Circuit) pins. You can buy them from MechaSkunk, but I went to Fry's electronics and bought a pack of 2 IC plugs that had 48 pins in them for about $4. The downside is that you have to chop up the IC plug to get at the IC pins that it holds. The ones Mechaskunk sells are already freed and ready to go.

I use IC pins inside thrusters, pointy-end out. I use the other round end for gun barrels and small thrusters. The IC pin has different thicknesses along its length. A 1mm drill bit opens a hole perfectly for the part behind the round end. This lets you push the pin in and leaves the round end above the surface. Red Comet has an article about using IC Pins on his Ghost of Zeon website.

Here are IC Pins used inside the thrusters of my HH:

I used the other end of the IC pin to make a barrel for the funnels in my HGUC Sazabi:



Scratchbuilding Part 5

Making Other Shapes, and Adding Polycaps

Plastic Tubes/Rods

Having talked about what you can do with flat plastic sheets, I want to get back to Evergreen's tubing. By tubing I mean a hollow piece of plastic. Evergreen "tubing" comes in round, square and rectangular cross-section. An important feature of Evergreen's tubing is that it's telescopic. This means that it's designed so that one tube (say 1/8") will fit inside the tube that is 2 sizes larger (3/16"), check out this chart: Evergeen Size

Chart. You can also slip metal rods into the tubes. This is helpful for making pistons and for building up structures in layers.

I cut this tubing using an X-Acto saw (not a saw blade in a regular X-Acto knife, but an X-Acto saw) and an X-Acto miter box. A miter box is a sawing guide that has slits in it that allow you to saw 45 and 90 degree cuts in whatever you can fit inside of it. There are grooves along the bottom of it to allow you to hold various sizes of tubing while you cut them.

I used the telescopic nature of Evergreen to make the hydraulic pistons on these weapons stands and the stands themselves use two different sizes of rectangular tube so that they can appear to be hinged. You can also see where I added the dark gray Kotobukiya bits for detail. The large vents on back are leftovers from my favorite MG FAZZ kit:

Making Rounded Shapes

As opposed to building boxes, creating rounded shapes like the shapes in most Zeon designs is much harder. I dealt with this in my never-completed Jin-Roh Patlabor project. The best method I found, which we used to use when carving wood block into rounded shaped for RC airplanes was to use formers to guide the shape you are trying to create. In these examples I cut a piece of plastic sheet into a cross section of how I wanted the piece to look, and then I filled in the remaining space with putty. In this case I used Magic Sculpt. Magic Sculpt is easy

to work with when its wet, but dries hard as a rock, literally. So, to save time with the Dremel tool grinding it, I learned to try to get it right from the start.

Here are the formers on the knees, ankles and feet of my Jin-Roh Patlabor before filling the shapes in with Magic Sculpt:

After filling the shapes and some final sanding/grinding, the legs look like this:

I also filled in the insides of the existing square-shaped armor with Magic Sculpt so I could grind it down to a round shape without worrying about going through the plastic:

The whole thing, after primer:

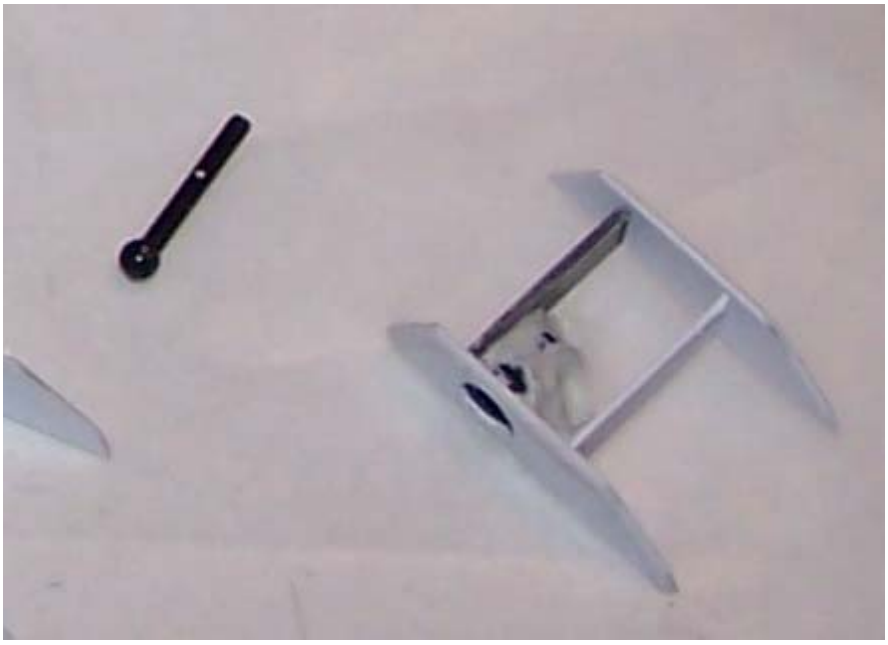
Adding Polycaps

We're used to poseability in our models and when your scratchbuilding, you'll probably come across a time when you want to add some polycaps to your scratchbuilt parts. I don't have **one** good way of adding polycaps. The problem is that polycaps are made of a smooth rubber plastic that does not stick to glue. I've tried many kinds of glue, and CA glue works best, but won't hold a new polycap that well. My best advice for polycaps is to scuff them up so that the glue can get a better "bite" on the polycap, and to surround the polycap with as much plastic as you can to give the glue as much surface area as possible to hold it in place. Or, if you are installing a ball for a ball joint, try to pin it like you would a resin kit piece to give it some added strength.

I've saved just about every extra polycap from every model I've built so I have 2 Ziploc bags full. What are harder to find is the right size rods and balls to fit inside them. I bought quite a few different ball and ball and sockets sets from both Wave and Kotobukiya. You can find them the same way you'd get plastic option parts.

Having said that, here are some examples of some polycap installations I have done.

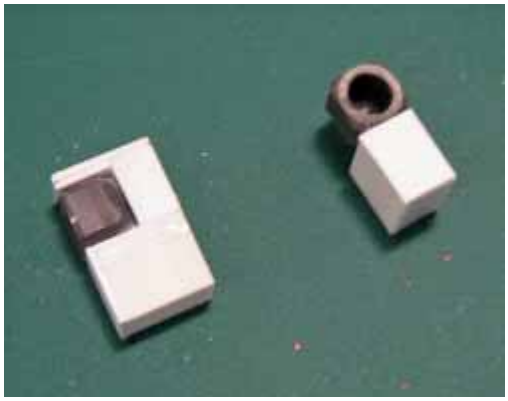
Here's an early effort. It's the polycap the holds the wing onto my Super Astray. I placed the partially built box onto a piece of wax paper and then smothered the polycap in Magic Sculpt. The problem with this approach is that Magic Sculpt really doesn't stick to plastic that well, and in a couple cases I've had a block of Magic Sculpt just let go of the plastic it was attached to. Fortunately, CA glue re-stuck it pretty well:



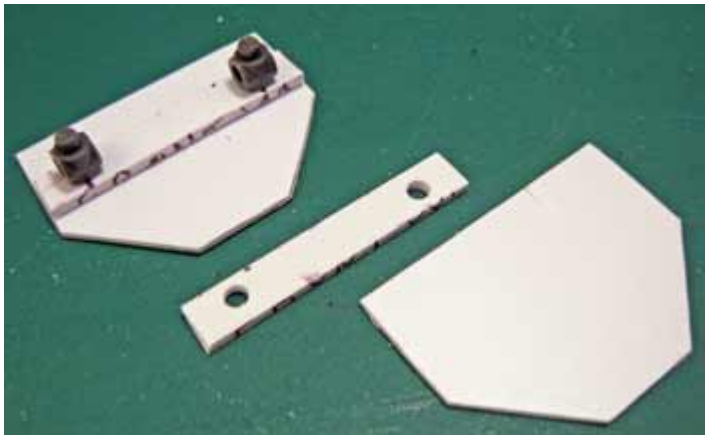
Here's a case where glue would not hold the polycap. I wanted a standard polycap in the wrist of my JRP so I could put a normal Kampfer hand in place of the horrible rubber hands that came with the Spiegel. However, no matter what glue I used, that polycap kept coming free of the wrist:

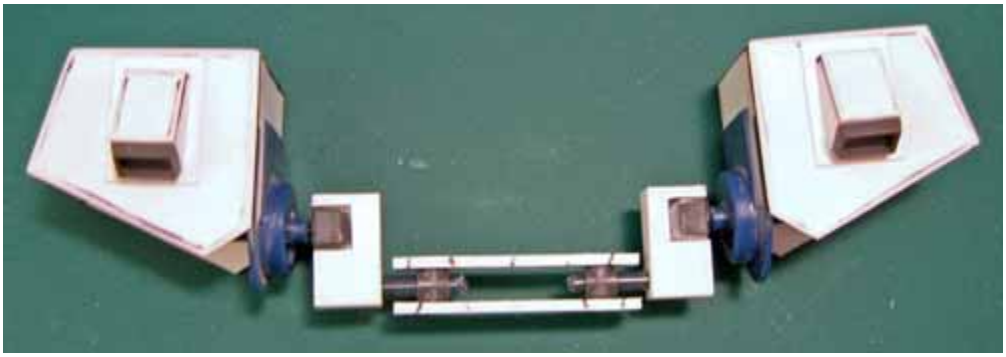
So, instead I jammed the polycap into the cuff of the Spiegel using Magic Sculpt (they're below the feet in this pic):

This polycap that holds the shoulder of my GAU is a good example of surrounding the polycap with lots of plastic, this one is closed in on three sides:



Here's the installation of the polycaps inside the backpack of my GAU. I cut some styrene strips to length and then measured, marked and drilled holes the same size as the round tabs on the outside of the polycap. I sandwiched the polycaps between the strips and glued the strips to the inside of the backpack so that the polycaps were still free to rotated:





Don't forget to use the work Bandai has already done for you. I made the mount for the rear skirt of my Hazel Hummingbird from the polycap mount on top of an extra Zeong booster. The white tube going through the polycap is actually a piece of sprue from a kit. It turns out that sprue is a metric size (I assume) and fits several kinds of polycaps perfectly:

Again, using sprue to mount a polycap. This is the plate on the bottom of my HH's thruster legs that mounts the Zeong thrusters:

Often, you have to use a shim to get a polycap to fit right, hence the pieces thin white sheet surrounding this polycap:

Here's another pivoting polycap from inside the shoulder shield of my HH. I cut the balls of some unneeded hands and attached them to some round tubing using a paperclip pin to hold it all together. The actual polycap is mounted inside of what started as a piece of rectangular tube. Rather than write a lot, I drew a picture of the process:

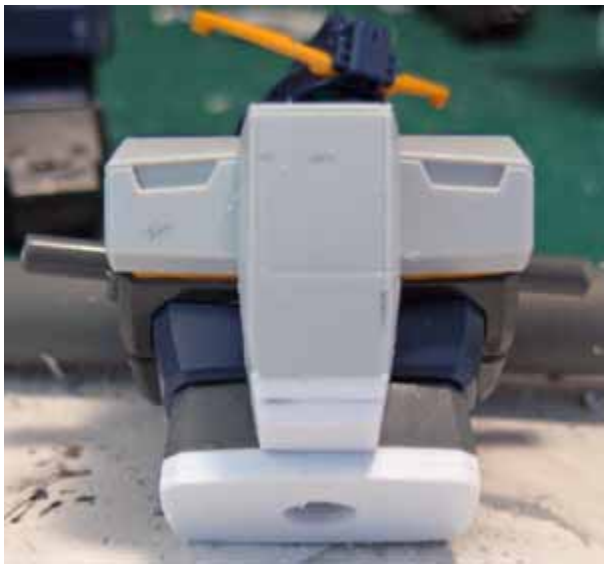
Lengthening

Lengthening parts of a model for better proportions is a pretty easy thing to do, although it may be hard in some of the newer MG kits where there are so many layers of moving parts. Fortunately, the kits that need the most improvement are usually older kits.

The easiest way to add length to a part is to build it, find a part of it with the least amount of surface detail, and saw it in half. Then add layers of plastic sheet, laminating them to build the part up to the length you want.

Once you've cut the piece in half, you can literally put it on your plastic sheet and trace around it. Once the top piece, sheets, and bottom piece are glued together, go at it with your bastard file and then CA/putty to make it smooth again and re-score any panel lines that need to be replaced.

I lengthened both the legs and torsos of my Hazels with laminated sheets of Evergreen plastic:



Well damn, that's about everything I know. 13 pages typed up in Word… phew! If I think of something new, or take better pictures of something I'll add it or edit the post.

Hopefully it was useful.