

Welcome to the Casting Couch

“To cast, or not to cast, that is the question. Whether tis’ nobler to purchase 11 Hasegawa weapons sets to arm your F-18’s with Snakeyes, or to make one really good looking master and cast copies of it for your own personal use. Ey, there’s the rub (with apologies to William Shakespeare)”.

Casting can be as simple or as complicated and expensive as you want to make it. The supplies necessary to make simple molds are available from the local Michael’s, Hobby Lobby, Tripp Plastics, etc. as well as from various on-line retailers who specialize in casting and mold-making. The real issue is how complicated a pattern-master you have and what your casting budget is.

Here are some key terms to keep in mind while we move forward:

Pattern-Master: The original item you want to make one or more copies of in order to complete your project.

Mold: (not the stuff you make Penicillin from) The vessel into which you will pour your casting material.

RTV: Room Temperature Vulcanizing (no John, you aren’t joining a *Stat Trek* cult) one of the various materials used to produce molds.

Resin: (AKA Epoxy Resin) The material you will use to make your copies.

Casting Buck: A stub of excess hardened resin or a chunk of plastic that your new part is attached to also called a gate or gateway (think Sprue).

Money: The stuff you’ll be spending to get the above. Will also go toward your Analyst’s bill.

Blood Sweat & Tears: (not the band) That which you will use while trying to make the castings for your project. Not really. It’s not that hard and it can be really fun too.

Items you will need:

Rubber Clay, RTV Kit or both (Castin’ Craft’s Silicone Mold Putty and Silicones, Inc. are both good choices).

Graduated Mixing Cups (Don’t shoot your wad on this one. Get them cheap on-line).

Dixie Cups (Again, go cheap as your going to use and discard them).

Mixing Sticks (Popsicle sticks or coffee/tea stir sticks are great).

Paint Brushes (Go cheap – get the 50 or 100 count packs for kids for a couple of bucks. Get the ones with the metal ferules as they are stiffer and hold up during pouring)

Rubber Gloves (Go cheap. Harbor Freight sells boxes of 100 for a good price so stock up. You’ll be using a lot of them).

Mold Boxes (discussed in Scenario 2 below.)

Xacto No.11 Knife & Fresh Sharp Blades (Don’t skimp as you’ll need these later).

Optional items that are great to have:

Long Tweezers (with the ends curled – will show in class), Needle Nose Pliers (make sure they are serrated), Small Side Cutters, Tooth Picks, Scissors, Garbage Bag, Air Compressor & Hose With An Air Duster Attachment (not the wimpy air compressor for your airbrush. You’ll need, to quote Tim the Toolman Taylor, “**MORE POWER!**”), Eye Protection, Digital Timer, Eyedroppers, Plain Facial Tissues

and Paper Towels. I'm sure there are many other things you'll include in your arsenal for casting once you've taken the plunge but this gives you an idea of other stuff you might like to have.

So let's talk about some basic casting projects. We'll start with something simple (yeah right!).

Scenario 1.

You are building a M2 Bradley and need a number of backpacks for crew stowage on the turret. You have a great looking backpack, but only one – what to do? Cast it, of course! Duh! Weren't you paying attention? First things first. You will need to glue a small square or block of plastic to the bottom of the pack. This will create the "casting buck" when pouring your mold and provides a gateway into the mold. The 'gate' will create a path for the resin to flow into your mold when casting. Now, on to the mold. The easiest way to go about making a simple mold such as a backpack is using a 2 part casting clay. It is a rubbery material that comes in 2 containers (Figure 1).

Figure 1.



The \$19.99 box on the left in Figure 1 that says "Amazing Mold Putty" or the one called "Easy Mold" in Figure 2 will both serve you well. It should set up in 10 minutes or so but experience has taught me that the clay has a tendency to require a bit more setting time. The only way to know for sure is to make a mold and try it. Using the backpack master as a guide, take 2 blobs (technical term) of the clay, each about the size of the master and kneed them together till they are a uniform color. Wrap the clay around the master and press the bottom flat against a smooth surface (your work surface, a 4 x 4 of sheet plastic or a glass sheet will all work). Make sure the gate end is uncovered so you have a method of removing your master and castings.

Figure 2.



Let the mold set up according to the manufacturers directions (I wait overnight, just in case – you dig). When the mold has cured remove the pattern-master. There are many ways to remove a part from a mold – rolling the mold between your hands to loosen the master and extract it with needle nosed pliers (can damage the master – be warned). Pulling the part out by hand is another option depending on how complicated the part is. My favorite method is to use compressed air from my air compressor (at about 100psi). Watch out as this can cause your part to shoot out of the mold and fly to parts unknown. Use eye protection for this one. A pair of large tweezers can be a help as well depending on the size and shape of the part. You now have a mold ready to use (or do you?) One thing I've learned about producing molds is to make sure they have completely cured. When you remove the master part you're exposing the inside of the mold surface to the air. The cavity that has been created by removing the master may still be a bit on the soft side. This is a good time to practice what we big guys like to call 'self control'. Let the mold continue to cure for a bit longer as it will be sturdier and have a greater longevity if the clay has not completely cured out.

Now would be a good time to talk about your casting medium. I prefer to work with epoxy resin. There are a lot of different types of resins on the market. Some are simple A & B 50/50 mixes that produce a plastic-like finished product (which I prefer). Others are a Base and Catalyst which need mixed by weight or volume and can be complicated, messy and smelly. Other casting options are Plaster of Paris, 2 part Epoxy Putty, Fimo Clay and even Sculpy is an option depending on the size and volume you are reproducing. **Warning:** Not all resins are created equal (see Figure 3).

Figure 3.



Some resin can be very tough stuff (seen a composite aircraft wing or a fiberglass boat hull lately?) so choose what you use *carefully*. Remember, you need to be able to work with it after you cast it (fear Dental Resins as they are rock hard and a bear to cut and sand). In Figure 1, the box on the right marked \$19.99 is one of the many types of 50/50 epoxy resins that will work for your backpack project. Many others can be found on the internet and at Hobby Lobby, Michaels, etc. so find something you like and stick with it (*Epoxy. Stick with it. Get it? Comedy is wasted on you guys!*).

A brief discussion about safety regarding resin is prudent at this point: **Use cheap rubber gloves.** Epoxy resin is, as I said, an industrial adhesive and can be used to glue objects to one another so, as Kelly Bundy would say, "to be forewarned is to have four arms"! What? Uh, anyway, use rubber gloves and **wear old clothes.** Don't wear your white tie and tails to cast in (imagine wearing a shirt that is as stiff as a board). Also, don't cast parts where you can spill resin on your dog or cat as they won't appreciate the bald spot they'll have when you cut the glob out of their hair. Likewise, don't do this over your shag carpet as the same result will occur *to you* when your wife shaves your head for ruining her carpet. Nuf' said.

For the above exercise (the backpack) let's assume (love that word) you've decided to use the 50/50 stuff I like. It cures by a chemical process that produces a minimal amount of heat so be aware. You'll need a pair of mixing cups (graduated ones are great as you do need to get the mix in the ballpark of 50/50) a supply of Dixie cups (the cheaper the better) and some sort of mixing device. I like wooden

ice cream or coffee stir sticks as they are cheap, can be cut in half, used over and are readily available at your local Walmart (shameless self promotion). Put a cover over your work surface if you don't want to have it covered with resin. It soaks into wood quickly (see Kelly B. note above) so a garbage bag taped down to your desk is a good idea. Be prepared for the inevitable spill as it happens. Pour your A & B resin into your graduated cups and fill them to approximately the same amount. The nice thing about most of the A & B resins is that they are relatively forgiving. If I recall correctly you can be off as much as 10% on your mix and it will still cure (but try to get it close). Now pour your measured amounts into a Dixie cup and mix. Working time varies and can be effected by humidity, heat and cold (remember I said resin creates heat – warm weather will cause it to cure more quickly than cold weather) so follow the manufacturers guide as to working time (I figure about 30 seconds max to mix). Try to blend, not to agitate, the resin as air bubbles are created. These have a tendency to become trapped in the corners of the mold and result in additional clean up of your finished parts (stirred, not shaken, Mister Bond). Now pour. Again, beware of bubbles. Try to pour down a smooth or less bumpy part of the molds interior (in this case, the back side of the backpack) and allow it to fill from bottom to top forcing the air out as it fills. Tap the mold lightly on your work surface or gently squeeze the mold to work loose any small air bubbles trapped in the mold. Don't be surprised if you mix too much resin the first couple of times working with a new mold. It's OK. It happens. Now watch and wait. Waiting, for lack of a better word, is good. The resin needs time to cure. It may take several minutes to gel. You now have time to use any of the excess resin you've mixed to fill pin-holes in previous castings or to fill in things like unwanted widows on an airliner. It's fairly forgiving stuff and has a lot of uses besides casting (remember it's a glue too) so don't be afraid to experiment. Curing for demolding parts usually takes 15 to 20 minutes with a full cure usually taking 24 hours. Once the resin has cured it's time to remove it from the mold. Repeat the process for removing the casting-master. Examine your work. You should now have a nice copy of the backpack. Repeat for as many as you need or till the mold starts to fall apart. Then make a new mold and repeat. The clay has a tendency to break down more quickly than a true RTV mold but it's still a great way to make enough parts for a simple project. Reproduction quality is good and only minimal clean-up and filling is required to achieve a satisfactory result. Be sure to give your resin time to finish curing before attempting to use your parts. A good rule of thumb is at least a day to degas and harden then cut and paint to your hearts content. Treat it just like plastic because it essentially is a form of plastic.

Scenario 2.

Your building a 1/72 vac-u-form aircraft model (just for you Bob) and you need 18 wheels for the landing gear on your project. You can go about the process in Scenario 1 but the odds are that you'll be making several clay molds when one RTV mold will net you all the wheels you need and more. It's time to consult "**The Book of Common Knowledge**" (shameless SNL reference). RTV or Room Temperature Vulcanizing rubber is a product that requites a bit more work and time than the clay above but is still a fairly easy process. RTV is a 2 part material that has a viscous catalyst and a thick gooey rubber that hardens when the 2 are mixed. RTV comes in many different grades and can be **very soft** or **VERY HARD**. Try to find a nice, mid range one like Silicones, Inc.'s Light Blue RTV (their web site is www.silicones-inc.com). It takes detail well but gives you the ability to 'work the mold' (massaging the air bubbles out) and demold the finished parts more easily. The one biggie with RTV is don't agitate it (as we discussed with the resin, Mr. Bond). Most RTV is a 10 to 1 mixing ratio. Yeah, I know what you're saying; now he wants me to mix something at 10 to 1. Fear not. Most manufacturers include the mixing ratio within an inner cap and scoop included in their RTV kits. This makes mixing a snap. The RTV itself tends to be a white to light gray goo (another technical term) and the RTV catalyst is colored with a dye to make consistent mixing easier. The major difference between the rubberized clay and RTV is how you set up the mold. First you'll need a box to contain the RTV. This can be made of anything as long as it is smooth and leak proof. I know many people who use Lego blocks to make mold boxes. The trouble with Lego's is they can leak. This is bad as RTV is a bit on the pricey side and you don't want to waste it. You can make your boxes out of Sheet Plastic or even card stock as long as it isn't to porous. The important thing is it's leak proof. So, your on your way to Michael's, Hobby Lobby, Tripp Plastics, etc. to get your casting stuff and it hits you. You're hungry. So you stop at Mickey D's and get some pancakes (or nuggets depending on the time of day). You'll get great 'mold boxes' with your meal. The little dipping sauces or syrup containers make great vessels for your castings. Be sure they are clean (I know some of you thought I poured my RTV right on top of the sauce -- really?!) Virtually any blister pack or vac-u-formed container can be a mold box as can disposable plastic cups. You're going to be gluing your master into the bottom of the box so make sure it's clean. Gluing it into the box?! Are you mad?! Damn it Jim, I'm a model builder, not an engineer!!!

Well here's the thing. You remember the casting buck we talked about with the backpack, well, you're gonna' have one on the bottom of your wheel master. Make your master (as detailed as you like) and attach a block to the bottom of the wheel (where the rubber meets the road – so to speak). If you don't know what this looks like go to Squadron.com and look at any of their True Details line of wheels. See the block on the bottom? Ah, I just saw a light bulb come on over your head. Now you've got it. Take your master (attached firmly to the casting buck) and glue it to the bottom of your box – with Elmer's White Glue! Yes, I said good old Elmer's. It's great stuff as it will cure and hold the wheel in the mold box, but, when the time is right, it will also let it go (more about that later). Now comes the first time you're going to mix RTV. Remember the lecture above about safety and resin. The same applies to RTV. Till it's cured it sticky and gooey and is a great way to ruin cloths (super for waterproofing though). It doesn't smell too bad but I wouldn't want to do it in the house as your SWIMBO might be distressed. You'll need something to mix in and something to mix with so get some cheap plastic mixing bowls (or "I Can't Believe It's Not Butter" tubs) and some cheap, but heavy-duty, spoons (back to Mickey D's for a Mcflurry) and you're ready to mix. Now, the tricky part. Remember I said RTV is expensive, right. Well the best way not to waste it is make up several different molds with several different masters. That way, when you mix up too much RTV, you can pour the excess into (onto?) another master and not waste any excess. One of the nice things about RTV is that it only sticks to – ready? Itself. Cool, huh? You can pour RTV over other, cured RTV and it will bond like Superglue (that's why you need mold release for 2 part molds but that's for another time). So you're ready to mix up your RTV. You've measured the rubber into your bowl and poured the catalyst in as well. Now mix, but do it sloooowly! The key to producing a mold that doesn't have issues is keeping the air out. Air bad! *Bad air! Bad!* RTV good! So mix it slowly. Unlike resin, RTV has a long work time (usually 30 minutes or more depending on the type) so you've got time. Once it is a uniform color the moment of truth has arrived. You're going to pour the RTV over the master. Here's a helpful tip. Buy a pack of cheap (and I do mean cheap) paint brushes. You know the ones that come 50 to a pack for a couple of bucks at Harbor Freight. Take a brush and dip it in the RTV. It's OK. You'll be tossing the brush so don't worry about how to clean it, cause' you're not gonna'. Take the brush full of RTV and gently brush it over the surface of your master. Work it into all the nooks and crannies of the part. **Do Not Scrub! I Say Again, DO NOT SCRUB!** Scrubbing creates bubbles and you are trying to eliminate them (I know some of you are having a commercial for Scrubbing Bubbles running through your heads right now – it's OK, I understand). This can be a scary experience the first time you do it because you'll worry you might never see your master part again. Don't worry. You will. Once the part is covered and any little spaces an air bubble might be hiding or trapped have been eliminated pour the rest of the RTV into the mold from one corner. It will fill the mold but it will take its own sweet time about doing it. Once the mold is filled set it on a flat, level surface and (this is important – I mean that now) walk away. Don't touch it. Don't do it. I saw you Herdner! I said don't touch! Let the RTV cure for at least 24 hours. 48 is better. The older the catalyst the longer it takes to cure. Temperature affects it as well. Remember, the *RT* in RTV stands for room temperature. Warmer weather promotes a quicker cure than cold. If you're cooking your meth (oops wrong forum) pouring your RTV in your garage take the poured mold in the house and find a place to put it till it's had time to cure. I've heard of people putting their RTV in the oven overnight with the light on to promote curing but most SWIMBO's don't approve of this sort of thing so find a spot out of the traffic pattern and away from kids and pets. Keeping the mold level is the important thing. Don't want a lopsided mold. Once the mold has cured for a couple of days touch the surface (It's OK to touch it now John). If it's sticky or leaves a fingerprint impression it's not fully cured. Walk away. Check again in a day or so and it should be hard. 3 days is the longest it has taken for a mold of mine to cure and that was in Winter in a cold garage with a space heater. Now you are ready to separate the master from the mold. Just like with the clay, massage the mold box around the edges. You can use compressed air to loosen up the mold but use eye protection. Now the cool part about the White Glue. You'll feel the part pop loose from the bottom of the box. It's OK. You want it to. Remove the mold from the box. If it takes tearing the plastic box to pieces it's OK, now you have an excuse to go back to Mickey D's! You think opening presents as a kid at Christmas was fun. The first time you pull a master out of a mold you'll be stoked. Let the mold rest and cure for another day (just like in Scenario 1 above). Now, follow the directions in Scenario 1 for casting a part. The difference is you'll be able to pull a lot more parts from your mold. Another thing about RTV molds is, when they start to break down or tear, you can fix little rips and tears with more RTV! So keep your old molds and fix them when you pour new ones. Like I said RTV loves to stick to itself so a little excess glob on the corner of a mold and it will be good for a few more castings.

Question: What do you do with old molds that are no longer viable? Can I throw them out? Yes you can, but why would you. They still have many uses:

1. Take an old mold and cut it into small $\frac{1}{2}$ " to $\frac{3}{4}$ " cubes. On one side cut a tiny slit in each using an Xacto knife. You have just created a paint mask for propeller tips. Paint your prop tip yellow. When dry, slide the tips of the prop blades into your 'mask'. Spray the body of the prop Black, Steel or whatever is called for. Let the paint dry a bit and then pull the masks off. You now have a prop with yellow tips courtesy of an "old mold". Paint does not stick to RTV so simply rub off any overspray and you're ready to go again.
2. Use small pieces of old molds as bumpers in your completed model carry box.
3. Use large old molds to protect Xzacto knife blades from being damaged.
4. Drill (yes you can drill RTV) a small hole and slide the pitot tube of say an F-100 to protect it while your building and painting the model.

There are as many uses as you can dream up on your own. Remember to share your ideas as there's always a better way or a new way to do something.

Scenario 3.

Now you're ready for the big leagues. Consider the following investments:

1. A pressure pot(s). I made mine from 1 gallon paint pots from Harbor Freight. Pressurizing your molds while you're casting pops a lot more those pesky air bubbles and creates a better quality casting.
2. A vacuum chamber. It doesn't need to be big to make a big difference in the quality of your mold. Evacuating the air from the RTV creates a denser and tougher mold that resists tears and produces a better quality casting. We'll have show and tell on this one in class.
3. A vacuum pump for the above. Even a Vacuum Sealer will help to evacuate more of the air in your molds. But, **Do Not** use your SWIMBO's kitchen sealer as you won't like the added aftertaste of RTV in your food.
4. A spin-caster. I don't have one myself, but for production molds they're great and produce a much more consistent casting. You can make one yourself. Go on-line and surf for ideas.
5. Pressure injection equipment for quality 2 part molds (again, we'll discuss this on a future occasion).

The above now makes you a professional nut job just like me and gives you a really good dose of AMS as well. You'll find you no longer have the ability to scratch-build anything without wanting to cast it too.

Ah, if I were king....

If you've read all the above (and I assume [oh that word again] that you have) you'll be ready to discuss this at the June meeting. If you've not read the above be prepared to write an essay on why you haven't. Please bring a No. 2 pencil and be prepared to take notes (that's mostly for you John).