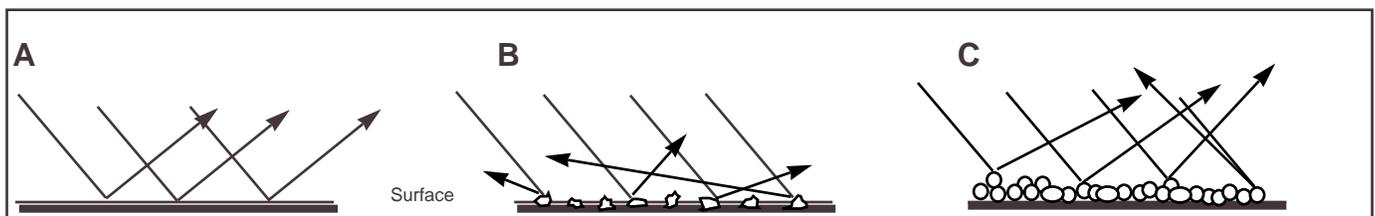


The word "decal"---however it's pronounced---"dee-kal" by us Yanks, or "dekkal" by the Brits, is a shortened version of the word Decalcomania, which in turn is the English takeoff on the French word Décalcomanie....they were invented by French engraver Francois Simon Ravenet. Bet you didn't know that. Bet you don't really care, either, but like the current-speak "App" for Application and such, now you know some more trivia. Let's take a look at this aspect of modeling.

**Planning.** The first "secret" to proper decal application begins with thinking. Before you ever start construction of the model, you should have some basic idea of how you want to proceed with the painting and markings. Sometimes, for instance, I'll use just one or two decals from the sheet and paint the rest of the markings. Where compound curves are present, you have to anticipate possible problems making decals snuggle down so they adhere well and conform to the surface of the model---paint will always conform, so it's possible you may want to paint certain markings rather than relying on lots of decal setting solution. Develop a plan of action as you construct the kit.

**Surface preparation** is the next step in proper decal application. In order for a decal to adhere properly, it has to be applied to as smooth a surface as possible. A "flat" paint is flat because of tiny particles of talc or mica added to the paint to break up the reflective surface. Even if you spray a gloss paint too thickly or at too great a distance from the model,



Above: Diagram A shows how light reflects off a smooth surface. Diagram B shows how light is broken up and scattered by particles in the paint to achieve a "flat" finish. Diagram C shows what happens with a pebbly paint job, even with gloss paint. The same scattering effect takes place but to a lesser extent.

you'll get a semi-flat appearance because the paint particles dry and partially solidify before they get to the surface of the model. You should try to apply your paint in smooth, thin coats to avoid this. Some modelers lay their decals in puddles of Future or thinned white glue, and in effect those mediums are making smooth surfaces on whatever they're applied to. I prefer making my entire model's surface as glossy as I can so there's no difference in the patina around the markings.

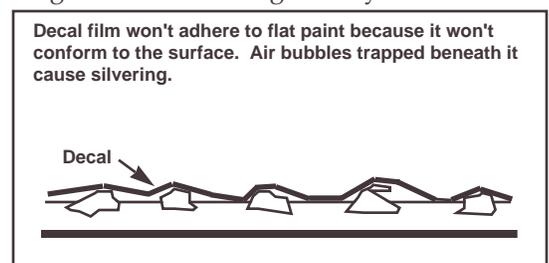
Modelers of military subjects have long used a standard system of colors known in the U.S. as Federal Standards, or "FS" colors. This just means that they're mixed to conform to the colors Uncle Sam authorizes for painting aircraft, ships, military vehicles, and even buildings. Each color has a five-digit FS number which is deciphered as follows: the first digit will always be a 1, 2, or 3---a 1 means the paint will be glossy, a 2 means it's semi-gloss, and a 3 means it's flat.

The second number is nominally the color family, though in reality only numbers 0 through 6 are actually colors. A second digit of 0 indicates browns, 1 is reds, 2 is oranges, 3 is yellows, 4 is greens, 5 is blues, and 6 indicates grays. 7 covers miscellaneous colors like blacks, whites, purples, and golds, and 8 means that the color is a fluorescent or "Day-Glo" color. The last three digits of the FS number are taken together as a group and indicate the order of increasing reflectance---a fancy way of saying the bigger the number, the lighter the color.

Federal Standard Number Color System		
FS 34087		
First number: 1 - Gloss 2 - Semi-gloss 3 - Flat	Second number: 0 - Brown    4 - Green 1 - Red       5 - Blue 2 - Orange   6 - Gray 3 - Yellow    7 - Misc. 8 - DayGlo	Last 3 numbers: Reflectance. High numbers = lighter colors

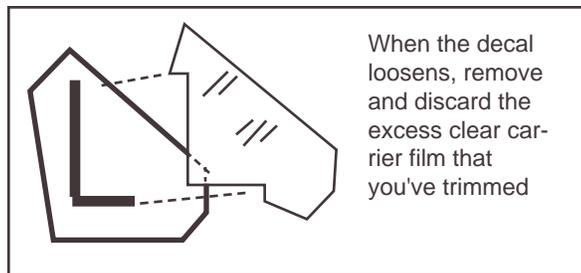
While that little discussion on paint might not seem to have a whole lot to do with decals, I wanted to point out that many model paints are formulated to match Fed Standard colors and painting instructions will generally tell the modeler to paint certain parts certain colors. Remember that if you paint your model with a FS paint starting with a "3", that means the surface isn't going to be glossy enough to get your decals to adhere properly. Hence, the surface preparation will require you to apply a gloss coat over your paint before you apply the decals.

**The Gloss Coat** is my next step of surface preparation. If you've painted your model with gloss paint, you may be able to eliminate this



gloss-coat step, but if you're using acrylics, I recommend you still use a clear to act as a barrier between the decal setting solutions (to come later) and your nice glossy surface. Make sure this coat is applied relatively thin and relatively "wet" and give it plenty of time to dry before you start. The paints you use are up to you--if you like enamels and have had good luck with them, then by all means use enamels. I use Tamiya acrylics almost exclusively and my gloss coat of choice is their X-22 Clear Gloss; it's crystal-clear and more importantly, doesn't yellow with age. Another way of making your surface nice and smooth is to polish the surface with ever-finer sandpaper and polishing compound, such as that found in an LMG or Millennium 2000 kit.

**Decal preparation** comes next. I cut each of the markings out first, then use a sharp #11 blade (and a good light) to lightly trim around each as closely as possible **if needed**. Today's decal makers have gotten pretty good so there's not that much clear carrier around decals and this step may not be necessary, but putting a big "NAVY" or similar decal on an aircraft wing where there's lots of clear between the letters, I prefer to get rid of that. The important thing here is not to cut through the backing paper, only the decal itself...since this is only a thin film of paint or ink, a light touch of the knife is all that's needed.



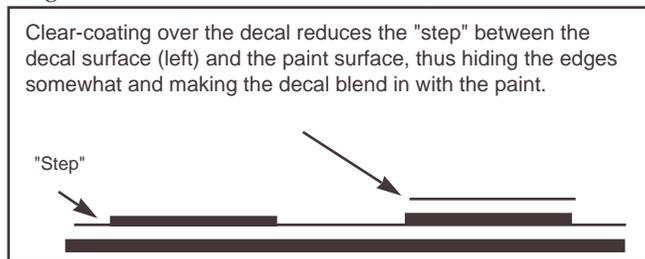
I dip the decal into warm DISTILLED water (my tap water contains minerals and other stuff that can leave spots) and place it on a clean, non-absorbent surface (I use a small piece of glass) and let it loosen from the decal paper; with tweezers or the tip of a knife, I carefully strip away the clear carrier film I've trimmed off in the above step and discard it. Using a small brush, I place a drop of water on the model where the decal will go, then dip the brush into a setting solution (I prefer Micro-Set) and place the brush into the water droplet to spread the water into a puddle. The setting solution acts as a wetting agent to break down the water's surface tension, and will allow the decal to "float" into place. It also softens the decal slightly to allow it to conform to the model's surface contours.

There are two ways to transfer a decal to the model. With a large decal, hold it by its backing paper with a pair of tweezers and using the small brush, slide it off the paper into the puddle on the model. Position the decal properly using the brush or (if you're careful) a needle. Be careful not to tear the decal film--if the decal dries out and gets difficult to move before you've got it where you want it, don't force it or it'll tear. Re-wet it with a drop of water and proceed. With a small decal, you may find it easier to simply pick it up off the backing paper with your brush and place it on the model.

When the marking is where I want it, I carefully blot the excess water up with a tissue or Q-tip and allow the thing to dry awhile. If I've got other decals to apply, I go ahead and do those, then come back to the first one and brush straight Micro-Set onto the surface of the decal, trying not to brush it onto the adjacent painted surfaces if I can help it. The Micro-Set will further soften the decal and allow it to settle down around curves and surface detail---but as it's doing this, it will sometimes "orange peel" and get all wrinkly-looking. If you've done this, don't worry about it, and don't touch it---it's pretty easy to tear the decal while it's soft.

After the decal has dried somewhat, you can gently press it into deeper crevices or around curves if it's having trouble snuggling down. For stubborn areas, I use Micro-Sol, and for really stubborn ones, Gunze Sangyo's Mr. Mark Softer. Brush this onto the surface of the decal (again, not the adjacent painted surface)---these solvents are lots stronger than the Micro-Set and will really attack the decal, so be careful not to tear the decal after you've applied them.

When the decal's dried sufficiently (sometimes the following day, and the orange-peel effect will have subsided by then) use a soft cloth or tissue and gently wipe the decal and surrounding area with clean distilled water, then allow it to dry. This removes excess decal glue and decal setting solution. When all is completely dry, I go back and spray another coat of gloss over the decal and surrounding model surface. This seals and protects the decal and also fills in the "step" between the decal and the model surface, which renders the decal much less visible.



After the gloss coat's dry, I then put the final finish over the top of everything---either a flat, semi-gloss, or gloss. For a really flat finish, I'll dust the model with (what else?) Floquil Dust. This is a weathering paint but applied very lightly, gives a dead flat appearance. Lastly, if you weather your model, don't forget to weather the decals, too, or they'll stand out.

## TROUBLESHOOTING

Okay, all the foregoing narrative assumes everything has gone according to plan and your decals have performed just flawlessly as they're supposed to. Of course, in the real world, that doesn't always happen. So let's look at some common problems and how to solve them. Remember---it's lots easier to solve those problems before you put the final overcoat on, so inspect the model and the markings before you apply it.

**Silvering.** This occurs in clear areas of the decal such as inside O's and D's when the decal isn't in contact with the model's surface, and is caused by light reflecting off the model's surface, through the little air bubble trapped there, and onto the back side of the decal. To solve, pierce the silvered area of the decal a few times with a sharp #11 blade, apply decal setting solution, and as it's drying, gently press the decal down.

**Air bubbles and failure of the decal to snuggle down around details** can be taken care of in the same manner as silvering. Remember, however, that you're destroying the "structural integrity" of the decal film---the more holes you poke in it, the weaker it'll be---so press it into place very carefully.

**Puckering** occurs where, for instance, a decal can't follow the contour of a model's surface curve. To rectify this, use a sharp #11 blade and gently slice the decal where it's puckered to relieve the strain. Apply a drop of setting solution and press gently into place. Drop the knife into your lap and as it falls, you'll know the true meaning of puckering.

**Disintegration** may occur if the decal is old or brittle. Normally this will happen when you try to apply the decal or even sometimes as it's dipped into water. And usually the night before a contest when the hobby shop's closed and you don't have another decal to match. My usual test for decal "freshness" is to smell it before I ever start cutting the markings from the sheet; if it smells faintly of paint or like a new magazine, it's normally OK. If it doesn't smell, I try and head off the disintegration problem by experimenting with another piece of decal on the sheet that I don't intend to use....if it's OK, I use the sheet as is. If it starts breaking up, though, I either give the entire sheet a spray of Tamiya clear gloss and allow it to dry or use Krasel's Superfilm. This is a product which can be brushed over an old decal and will restore its clear overcoat so it can be used. Superfilm makes the decal a little thicker than than it was before.

**Yellowing** can occur with old decals. Prior to use, tape the decal sheet to a sunny window facing outside and the sun will bleach it out so it's like new. Be careful the window doesn't sweat, though, or the decals will stick to it.

**Transparent decals** are those which are so thin the model's color shows through; unfortunately, this doesn't show up until you've applied the decals to your model. Depending upon the colors and decals involved, there are several tricks you can use to solve this problem. You can either cut a small piece of decal film the same color as the surrounding paint color and slip it under the decal (which you've lifted off with water and lots of care) or you can apply an identical decal right over the first one when it's dry.

**Wrong! Wrong!** This malady occurs after the decal has dried and you discover it's either the wrong size or in the wrong place. Whatever, you have to remove it. Lots of water and careful monkeying around with the brush will usually loosen it so you can correct the problem. If you break the decal or if you don't need to save it, it can sometimes be removed by sticking a piece of tape to it and pulling it off.

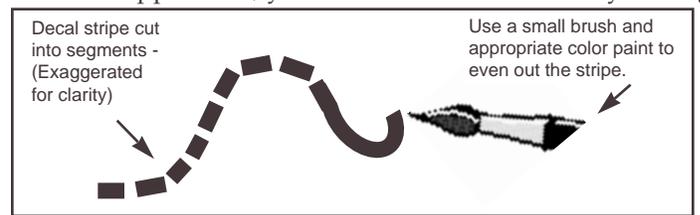
**#&%@\*#!!** will occur at various times during the decaling process. One frustrating thing is to have a decal fold back upon itself while you're trying to apply it. The thing will resist all attempts to straighten it out---the quickest and surest way to fix this is to pick the decal up and place it into the water dish, where it will immediately relax and unfold. I use a small piece of plastic card to slip under the decal and use the brush to slide the thing onto this card. Then I start the application process all over again. If you've really messed things up, you can launch the model into the far corner of the room and repeat #&%@\*#!! a couple of times but by the time you get the thing to this stage of the finishing process, you've put a fairly sizeable amount of effort into it so try and resist the temptation to play Nolan Ryan, cool down, and be confident that even the worst decal mistake is fixable. Frustrating, maybe tedious, but fixable.

## TRICKS, TIPS, AND OTHER FUN WITH DECALS

1. Solid color decal film has lots of uses. Stripes and circles of various sizes can be cut from these sheets and used to make your own decals. Use them to make window frames or racing stripes. A neat trick is to paint a piece of green decal film (or grey, if you're doing modern aircraft) with the model's exterior color, and use strips of that for canopy and window frames. You'll have the right color on the outside and something that looks like green zinc chromate /interior green/interior grey on the inside. Fred Cady makes the best solid color film, in my opinion, but it's hard to find. Xtradecal is good---Superscale is OK but tends to have a shorter shelf life.

2. If you need a special color decal film, paint a small portion of a trim film sheet the same color as your model.
3. Spit on it! Some decals just flat refuse to budge when applied and if you put them in the wrong place, you stand a good chance of tearing them if you attempt to do so. The solution is a small drop of saliva put into the water puddle on the model and the thing'll move just fine. This doesn't imply you should hock up a big oyster, just touch your finger to the tip of your tongue and then to the model just before you apply the decal.
4. To cut decal film to fit curves, I use a draftsman's ellipse or circle template and that sharp #11 blade. Hold the template up to the model and determine the approximate curvature needed, then lay it flat on the trim film and cut out the strip you need.
5. To cut narrow curved strips, hold or tape two #11 blades together; the small distance between the blade tips will cut a constant-width strip. Wedging a plastic shim between the blades will make a wider strip.

6. If you have a curved strip that just won't make the sharp curve it's supposed to, you can decrease its radius by cutting it into small segments (see "puckering") and arranging them so they form the basic curve. Use a small brush and appropriate paint color to touch up the open spots between the segments.



7. Be aware that when you buy someone's second-hand decals or those in the "Special" box at the hobby show, you may have the disintegration problem. Give 'em the sniff test, but if there's any doubt, give 'em the clear coat treatment. (Hint: if you buy something called "Micro-Scale" decals and they're not railroad markings, you've got an old set of decals. Micro-Scale is the old name of the Super-Scale company.)

8. You can use dry-transfer (rub-off) sheets sold in art and office supply stores for custom lettering and so forth if you can't find decals that'll fit your purpose. You can rub them off directly onto the model if they're in the right place, but be aware that if you don't completely rub them off you'll have a hole in your number or letter. I've found a better solution is to rub them off onto an unused corner of regular decal sheet, and treat them as VERY delicate decals when you wet the thing and transfer it to the model. Yes, it does work, and if you get it folded over or otherwise ruin a letter, you've normally got lots more on that dry transfer sheet to use.

9. Got a complicated decal shape that you're going to need to butt up to your paint job? Run the decal sheet through a copy machine, then cut out the appropriate decal "duplicate" to use as a guide for masking your paint.

10. Despite what I said about needing a nice glossy coat to apply decals to, there ARE other ways to stick a decal in place. You can apply it in a puddle of Future Floor Wax (now sold as Pledge With Future) and it'll snuggle down and be stuck on forever; you just have to be careful to clean up the area of wax around the decal before it cures. Some people use a solution of white glue and water about the consistency of skim milk to dip their decal into, instead of the distilled water I use. They claim great results, but I've never tried this method. I do use Future to stick small decals to cockpit consoles and the like.

11. When mixing paint to match a decal, put a small drop of the mix on the decal paper next to the decal, allow it to dry and you'll get a truer picture of how close you've come.

12. Keep a written record of all paint mixes---proportions, paints used, etc., for future reference.

13. After I apply decals over a NM finish, I sometimes brush Future over them to seal and protect them, and it's okay to let a little get on the NM. As to the appearance of "paint" versus "NM", remember on the real machine, those insignia and things are actually paint so they'll naturally have a different patina than the metal surface. There's no prototypical reason to try to make them the same.