



# dave platt models

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## A COMPREHENSIVE AND SPECIFIC GUIDE TO A TROPHY-WINNING FINISH FOR THE SCALE MODELER

by Dave Platt

### INTRODUCTION

Covering and finishing a model can be as absorbing and pleasant a job as any that our hobby has to offer. Indeed, it could be true to say that a percentage of scale modelers may unconsciously be artists—they love to paint, and a scale model provides an incomparable opportunity to follow this desire. The airframe itself becomes, in effect, a three-dimensional canvas. Upon this base, the builder can find intense fascination in creating what may, in every respect, be called a living work of art.

Why, then, is it also true that, for another modeler, this same process is a hated chore? This poor fellow's past experience makes him foresee the potential ruination of his finely-made airframe . . . and he dreads every minute of it.

We believe there are three distinct ways for the unfortunate guys in the second category to place themselves among those in the first. These are:

- a). Skill
- b). Technique
- c). Expectation

The first two are fairly obvious, and the remainder of this booklet will describe ways for improving these. Let's take a look at Expectation.

It is very unfortunate that the covering and finishing process is often regarded as an important but *minor* stage in model building. The feeling is: "Okay, the model is built—let's get it covered and we can fly it tomorrow!" To some extent, members of the model trade tend to encourage and foster this belief. They advertize materials as "instant answers." It seems that many things today are designed to produce quick results, and they sometimes work. But, by and large, there is no "free lunch." Rapid methods often lead inevitably to miserable consequences, and the trusting modeler thinks it's his fault.

We'd like to set the matter straight with a few home-style truths:

*Fact*—Covering and finishing is a *major* stage of model building.

*Fact*—It takes as long to do a good job on the exterior as it does to build the airframe (we figure that a model which is built, with engine and radio installed, is 50 percent complete).

*Fact*—The above estimate applies to *experienced* builders.

*Fact*—The pleasure derived is directly proportional to the quality received. Thus, while you may spend more time, the job will be better and you'll enjoy it more.

By now, if you've always had nightmares with covering and finishing, you should be saying something like this: "Wow, no wonder I've never done too well! If it takes the experts a while, I didn't have a *chance* of a good result in the time I spent!"

True! And all because nobody told you what to *expect* and regard as normal. Our hope here is that we've got you convinced that the trick is to *slow down*. This is the way of the experts.

Before we get into a blow-by-blow account of the methods we use to cover and finish a scale model, we'd like to explain one other important thing. Although we used the term "trophy-winning finish" in the title, we wouldn't want to be misunderstood in this matter. We are not necessarily referring to a rich, deep 20-coat gloss. The true art of scale modeling is to "tell it like it is." In seeking to model a full-size subject in miniature form, we should contrive to reproduce that subject as it really looks—good, bad or indifferent.

Indeed, it will be found that to copy the scruffy look of a well-used plane convincingly can be much more difficult than to get a smooth and glossy finish. Of course, if our subject is indeed clean, bright and shiny, we want our model to be so. But we might be modeling, say, a combat warplane with a victory tally or mission-count to its

name. If this were the case, it is obvious that this subject didn't get these credentials overnight . . . it took time, and time puts a toll on the outside of an airframe.

With this in mind, remember that the somewhat battered and very dirty scale model, when well done, can in every way qualify as having "a trophy-winning finish."

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Alright then, with the above qualifications made, let's proceed to this worthy aim. It has been truly said that you can't make a silk purse out of a sow's ear. Neither can you get a beautiful finish on a roughly-built airframe. This is why we'd like to begin with a chapter on "Preparation."

### PREPARATION

The essential difference between a poor model and a great one can all be summed up in one word . . . *sandpaper!*

There never was a ding in an airframe that couldn't be filled and sanded level, or a protruding spar that couldn't have been sanded flush.

One horror we sometimes encounter on all-sheeted subjects is what we might politely call the "starved-horse" look. When sheeting sags between the ribs in a wing or the bulkheads in a fuselage, that undulated surface is what we call a starved-horse. There are a number of defenses against this. Two that are obvious are a) use more ribs or bulkheads, to shorten the unsupported span, or b) use firmer wood for the skins.

Other factors that may not be so well known, but are equally important in sag prevention, are c) use only curing-type finishing products, i.e., avoid air-evaporating materials where possible (more on this in our "Materials" chapter), and d) sand all skins thoroughly *after* joining and cutting to size, but *before* attaching them to the model.

Sanding of skins after they are in place must be held to a minimum. Never join skins on a wing, for example. (What happens is this: Naturally, you have to sand the joints. The sheeting is pressed down by the sanding block between the ribs, and the area supported by a rib is sanded very thin. These thinned areas then show later as depressions which give a rippled appearance. Obviously, strength is affected too).

Prior to covering, break down the model into the greatest number of individual components possible. Remove engine, radio, servos, horns, hinges, links, etc. Mask off the window areas only (but not the frames) with tape.

Finally, lightly hand-sand the component you're about to cover with 220 paper. Get it really smoooooth! Ready? Lay the part down on a foam pad or similar soft surface (watch out for loose pins that will ding the weak bare balsa) and you're ready to start.

## MATERIALS

Over the many years we have been around model building, we've seen more "new and miraculous" ways of covering and finishing a model than there are P-51 kits on the market. A few of these have stood the test of time. Many haven't. Some are around that have useful applications in other areas of modeling, but do not give good results on scale models. Let's list the various materials and see if and how they'll work in our special situation.

**Plastic films:** One of these (Super Monokote) is extremely useful as a parting film when making fillets, etc. (To be discussed later). Other than this, films should be avoided for covering a scale model. Many fine airframes have been spoiled by plastic film covering, which invariably wrinkles badly sooner or later. I personally feel that mylar imparts a "toyish" look to a scale model. Plastic does have good (perhaps too good) gloss but, if you're reproducing a glossy subject, there are better ways, as we shall see.

**Silkspan:** Probably the oldest and most "traditional" of all coverings, silkspan (a rag paper) still is very useful to the scale modeler. It has the virtues of lightness, easy working, resiliency, and it's inexpensive. On the minus side it is, of course, weaker than nylon, and requires the use of dopes, which we'd rather avoid. We use silkspan on "fabric covered" control surfaces. A totally fabric covered subject (many biplanes, for example) can be very nicely done by "double covering" with heavyweight silkspan, or a layer of silkspan first, then lightweight silk over that.

**Silk:** Silk is useful mainly when applied over a base layer of silkspan, as

just mentioned. Silk alone does not do an entirely satisfactory covering job. This is because its open weave allows too much dope to soak through—this forms drops or "tears" of dried dope on the inside of the silk. Needless to say, the appearance is terrible.

**Nylon:** Nylon solves many of the problems of silk, having a close weave which keeps dopes or paints from penetrating too far. Dacron and several other man-made fibers fall into this same category. For a covering material on a fabric-covered model, one very suitable material is polyester. This is sold at fabric stores as a lining material . . . it is inexpensive and very strong.

**Coverite:** Coverite is a model-trade material, being a man-made fiber with an adhesive backing. This is ironed on and is heat shrinkable. Quite expensive, but a fine product that will give very good results when you follow the directions that are supplied. One small point of dissention is that the Coverite manufacturer recommends against using nitrate dope on his product. Our experience indicates this not to be a problem.

Taking all of the factors into account, our own order of preference for fabric-covered subjects would be:

- 1). Silk (over silkspan)
- 2). Coverite
- 3). Polyester
- 4). Nylon
- 5). Silkspan (double layered)

It should be noted, however, that all of the above materials will give good results on a fabric-covered subject, depending on your skills in working with them.

**Fiberglass cloth:** Glass is found in hobby shops in two weights:  $\frac{3}{4}$  oz. per sq. yard, and 2 oz. per sq. yd. Generally speaking, the 2 oz. is useful for wings and fuselages of large (over 6' span) models. The  $\frac{3}{4}$  oz. cloth is best used for empennages on these larger models, and as an overall covering for any smaller model. Glass cloth is the standard material for covering any all-sheeted airplane, since it works well with resins to produce a strong and durable finish. This technique is superior, in every respect, to any other method.

This about covers the coverings, so to speak. Let's move on to the paints.

**Nitrate dopes:** When it is necessary to use dopes, this is the one to use. Nitrate dopes are not fuelproof, nor even fuel resistant (this doesn't matter, as we will only use the clear). This material can sometimes be hard to find. K & B sells a clear nitrate through hobby outlets, if you need only a small amount. If you're doing a whole

model, get it by the gallon from the local aviation supply house. Make sure you get the correct thinner.

**Butyrate dopes:** Butyrates are claimed to be fuelproof, but this is not true. Also, they have several more serious deficiencies. They have a rubbery texture (like rubber cement or contact glue) and it's difficult to apply butyrate dope smoothly unless you spray it. The bond is miserable, and masking tape, etc., will immediately pull it up. This is so even after you have applied the color coats . . . the dope pulls away from the covering itself.

Another problem with dopes (nitrate or butyrate) is that they have poor color intensity, and it is necessary to apply many coats to get a solid color.

In summary, our judgment is that you'll do well to steer clear of butyrate dopes altogether.

**Dopes (generally):** We regard dopes as an inferior choice of paints, where there is a choice. There is good reason for our opinion. Cellulose-based materials shrink as they air dry. Though they appear to be dry within a short time, actually the process of evaporation continues for several weeks, or even months. During this time, the filler material (the paint's "vehicle") "sinks" ever more into the wood. The good level surface you worked hard to get will eventually show wood-joints and even, in some cases, the wood grain itself. This is an inherent characteristic of all evaporating-solvent type paints. It seems that no amount of care can prevent the inevitable deterioration of the surface smoothness.

Added to this is the naturally poor chemical resistance of dopes to the fuels we use. Though labeled "fuel proof," dopes are resistant, at best—fuel will eventually cause stickiness and premature deterioration of the finish.

A third disadvantageous trait of dopes is that a freshly applied coat will "melt" (reactivate) a previous coat. This necessitates a prerequisite of several coats of "sanding sealer" (a grain-filler usually made by mixing talc or other powder into cellulose or butyrate dope). You sand one coat smooth and, as you apply the next, it melts the previous coat, partially destroying the smoothness. Sure, you eventually win, but it's time-consuming.

The answer to all of these problems with dopes is to use a material which chemically cures instead. It is for this reason that today's scale modeler uses epoxy and polyester resins (we will describe these in detail later). While it is true that many "old-time" modelers can get good results with dopes, by and large we believe them to be outmoded. We restrict their use to occasions when we have no better alternative and, even

then, only to the use of clear.

**Acrylics:** One attractive feature of acrylic enamel or lacquer is that they are available (from auto paint outlets) in a bewildering variety of colors. They also are generally inexpensive, dry fast and work easily. Color intensity is moderate, but the bond is generally poor. Of the two, acrylic enamel is preferable to lacquer, as it shrinks less. Some acrylics have a tendency to "crack" or "craze" as they age. To overcome this problem, we mix in a flexible additive (plasticizer) used when painting rubber bumpers.

**Polyurethanes:** These come in two varieties: single-part and two-part. Single-part polyurethanes are available on the model market but have proven, for the most part, unsatisfactory. Their most serious fault is poor bond, and we have seen paint literally flaking-off models that were only a few weeks old. Color intensity is good and the materials work easily, but their fuel-proof qualities are highly questionable. By and large, we think it's wise to avoid them.

Two-part polyurethanes, on the other hand, are very satisfactory, but they have one unfortunate disadvantage. The vapors are highly toxic (poisonous might be more accurate) and *extreme caution is necessary when using them*. We cannot over-emphasize the importance of this. Polyurethanes can give magnificent results—second to none—but heck, this is a hobby; something we're doing for pleasure. It doesn't seem sensible to risk our bodies. Nevertheless, *provided* that the proper procedures are followed to make the job safe, a two-part polyurethane (best exemplified by DuPont's "Imron") simply cannot be beaten for a first-class job.

What are "safe" procedures? Some manufacturers recommend a back-pack (this is like an aqualung, where you carry your own air and breathe no outside air). No doubt, this would be best, rendering you immune from harm. It's not too practical for the average R/C fan, though. We have sprayed "Imron" with no ill-effect, wearing a gas mask and applying it outdoors, letting the breeze carry all overspray and vapors away downwind. It should be noted that the mask (get one that will give protection in a poisonous-gas environment—not just a "particle mask") must be worn while mixing the paint, too.

By now, you're probably saying something like "Holy smoke, Platt, what are you telling us here? Isn't there a good safe paint that will do what we want, without our wives collecting our life insurance?"

Good news. There are, and have

been for a long time. Two manufacturers on the American model market make excellent paints that pass the most critical trial. These are Hobbypoxy and K & B SuperPoxy. Both of these companies make a full line of finishing products. Of the two, we prefer K & B's resin and primer, but find the colors of both equally good. Since these seem to be the products of choice for the scale modeler, let's examine them in a little more detail.

**K & B resin:** We use this product along with fiberglass cloth, for covering any solid or sheeted area. After covering, a second coat of resin will seal the cloth properly, rendering it ready for priming. The resin cures fast, sands easily, makes an excellent base for primer or paint, and is unaffected by fuel. It smells a bit strong and may draw complaints from your family or pets, but it won't harm you. This is a polyester resin, and is not to be confused (or used with) epoxy resins.

**K & B primer:** This is a two-part white filler, which is applied after the resin is sanded. We have found this to be the best primer on the model market.

**K & B/Hobbypoxy colors:** Each of these consists of a color paint (Part A) and a catalyst (Part B). Until mixed, the shelf-life of the Part A seems indefinite, while Part B is a little less so. Once the parts A & B are combined, the paint is going to cure—even if you leave it in the can. In other words, it works just like epoxy glues.

Now, the color Part A comes only one way, but the catalyst Part B comes in two different kinds—there is a gloss variety and a matte (or satin-sheen) hardener. Depending on which catalyst you use, your model will have either a glossy or a dull finish. Either way, it's fuelproof.

There are a few things to note about this paint:

A). K & B SuperPoxy and Hobbypoxy are intermixable. You can use one's color and the other's hardener. The colors will mix freely, a handy attribute when we need a certain camouflage color and must mix one guy's yellow with the other guy's red, for instance.

B). Mixed paint will keep for several days in a refrigerator.

C). Colors catalyzed with matte Part B will dry much faster on the model than when the gloss Part B hardener is used.

**Thinners:** Either brand's thinner works well and you need not try any substitute—nothing else will work. For some strange reason, the K & B seems slightly better, even with the Hobbypoxy paint.

**Clear paint:** Both Hobbypoxy and SuperPoxy make a clear paint, which is

used with a catalyst just like the colors. The clear is used for a final spray over the color.

Before we leave the subject of paints, there is one more product we'd like to mention. DuPont makes a one-part acrylic primer (#100S) which has given us good results. This is a gray-colored filler, and it dries very quickly. You must use silicon carbide sandpaper with this primer, since it will load aluminum oxide paper.

So much for paints. There are a couple of other very useful products which we use extensively. One is micro-balloons. This is an ultra-light powder filler which, mixed with K & B resin, makes excellent fillets. It's handy for a number of other jobs too, which we'll mention later. Of the many brands and two basic kinds available, we favor the brown "phenolic micro-balloons" made by Prather Products. This company also makes a silica (pourable) version, but we found this kind less desirable.

Another excellent product we'd like to recommend is "Liquid Masking Film," made by Fliteglas Models. This is a material used during final painting for markings, etc., and it is basically a water-soluble sprayable paint mask. We'll get into this later on.

## METHODS

Over many years of building scale models, we have evolved various methods and procedures for the covering/finishing process. The one that is chosen will depend upon the subject we are modeling. Although we are giving detailed step-by-step suggestions, it is not intended to imply that these are the only ones which work. Variations can be made without risking disaster, and if you have developed techniques which work well for you, it may be as well to continue with them.

However, if your experience is limited, or the covering/finishing process has always given you a hard time, we'd suggest you follow the steps without modification. You'll be starting out with a proven method, and can devote your attention entirely to improving your skill level.

**Fabric-covered aircraft:** The covering material you have chosen will be one of two kinds: either iron-on heat-shrinkable (Coverite), or one of the fabrics previously discussed.

In the early stages of covering, the methods vary somewhat. For Coverite, follow the detailed instructions supplied with the material. An imperfect covering job with this product is almost always the result of not reading or following the instructions. Take special care with the grain direction, or a loose



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covering job can result. Once you have the ship covered and are ready for finishing, switch from the manufacturer's instructions to those described later.

For silkspan, polyester, silk or nylon, proceed as follows:

1). Sand airframe very carefully at all points of covering contact. Use 220 aluminum oxide paper. Fill any dings with a micro-balloons/K & B resin mix (or Dap brand vinyl-spackle paste), and sand out. Be very fussy with this job—the final appearance of the finished model depends on it.

2). Brush a coat of full-strength nitrate clear dope over all areas where the covering will contact wood. Allow to dry.

3). Lightly sand off raised fuzz with 220 sandpaper, and apply a second coat of clear. Allow to dry, then repeat the sanding.

4). Cut the panel of covering material a little oversize. Soak with water and squeeze out excess (leave the material only damp). Now, working as quickly as possible, smooth out damp material over area. Gently tug out any wrinkles. Do not be particularly concerned to get the material drum-tight but be sure to get it smooth and wrinkle-free.

5). Brush a coat of nitrate dope onto the fabric, but only where it contacts the wood. As the damp material and the dope dry, the covering should adhere well and shrink fairly tight.

6). Inspect the results. Any imperfect areas (wrinkles or obvious looseness) can be re-dampened and again doped. Only when the job is perfect can you proceed. DO NOT expect later coats of dope to improve a problem area! The covering job will never be any better than it is right now. If, in spite of extra attention, problems with wrinkles remain, remove the cloth panel and try again. You may have areas of blushed (white) dope. Do not be concerned, this is a normal reaction between dope and water.

The following steps apply to not only the fabric covering being discussed, but they should be followed when finishing a model in Coverite once the Coverite is already applied per manufacturer's instructions.

7). Brush, or better, spray a coat of thinned clear dope over the completely covered model. As this coat dries, the covering job should gain a little tightness and some of the blushed effect will disappear. Lightly sand the entire model with 220 paper.

8). If you are double-covering (silkspan), this is the time to apply the second layer of material. Wet the material and cover, using an overall coat of clear as adhesive.

9). Now apply three or four more

coats of clear, by spray if possible. The last coat should be well thinned (25 percent dope, 75 percent thinner).

The covering and clear doping now being completed, lightly sand the model in preparation for priming. The primer must be sprayed for best results. When the primer is dry (2 hours for DuPont #100S; overnight for K & B), sand very carefully. It is advantageous to use 220 or 320 grit silicon carbide "wetordry" sandpaper on the primer. Using it wet will prevent the paper from clogging. Remember the surface quality you are now seeing represents the quality of the final job—the color coats will not correct surface imperfections. If there are any flaws remaining, attend to them now with extra primer or filler, and sand out.

By now the model should be looking great. At this time, add surface details (such as rib stitching and tapes) as required.

**Rib stitches:** These are best represented by Elmer's white glue applied in thin lines across each rib at a suitable spacing. The glue is applied with a hypodermic needle.

**Rib tapes:** A number of methods have been evolved. Our favorite uses the serrated cutter from a wax-paper package to cut strips of paper (tracing vellum). The strips are soaked in water until they become limp, and are doped down over the glue "stitches." An additional coat or two of clear dope will make the paper ready for color.

When the colors needed have been acquired or mixed (we'll discuss color mixing later), the model may now be painted. For the best effect of realism, pay close attention to the degree of gloss you need. Many full-size aircraft are matte or satin—in these cases, use the satin Part B.

However, even in cases where the prototype is "glossy," it is unwise to use straight gloss Part B. Very few full-size subjects have the rich deep gloss that model epoxy paints normally achieve. A much more convincing effect is produced by dulling the shine to some degree by pre-mixing the gloss hardener with 10-20 percent satin hardener.

The actual technique we use is to paint the model entirely using *only* matte catalyst in the paints, achieving the final degree of sheen required by means of a final clear coat. This makes use of the faster drying-time of the matte paints referred to earlier. If a gloss effect is wanted, give a last coat of clear, using the gloss catalyst.

This brings up one important point: ALWAYS apply one coat of clear paint, over the whole model, after it is completely painted. There are several reasons for this:

A). The model feels, and is, smoother. Masking tape leaves a slightly raised edge on succeeding colors and this is diminished by an overall clear coat.

B). The fact that we are going to apply a clear coat allows wet-sanding (with #600) the color paint. We don't have to worry about the loss of gloss produced by the sanding. The result is an even smoother finish than A) alone will give.

C). The final sheen will be consistent over the whole model. The degree of gloss between various colors on a model tends to vary somewhat. This is particularly true when applying camouflage finishes with matte paints, and is due to variations in "dryness" of the paints as they hit the surface. Soft mottling, for example, is applied very "dry" (99 percent air, 1 percent paint) and will appear more matte than overall base colors which are applied wetter. The final clear coat, matte, glossy or anywhere between, will cover these dull-and-shiny areas with a consistent overall sheen.

D). A clear coat protects the colors from wear due to rubbing on car seats, etc. Such protection is especially vital over weathered paint jobs.

E). An overall smooth, level clear coat makes the airplane easier to clean, and thus more fuelproof.

Okay, you ask, if one clear coat is necessary, might two be better? Perhaps. We'll leave this to your judgment . . . we use just one.

One last technique we use and recommend is to pre-mix the catalyst Part B with thinner. This only applies in the case of *satin* hardener—it is not necessary with gloss Part B. As supplied in the can, satin Part B is very thick and sludgy. This makes it difficult to stir to an even consistency, and can lead to wide variations of sheen from paint batch to batch.

Since we will be thinning the paint before application anyway, we have found it an advantage to pre-mix the satin catalyst with an equal volume of thinner. Indeed, we normally keep a good quantity (a quart or so) of this mix ready to be combined with any of the numerous colors on a typical model. The ratio, instead of 1 part color to 1 part catalyst, is now of course changed to 1 part color to 2 parts mix. This gives a 1-A to 1-B to 1-thinner final ratio, which is an ideal viscosity for spraying.

Naturally, that can of "mixed" Part B will settle out fairly quickly, but a vigorous shaking is all that is needed to properly blend the "powder" in the solution. While on the subject of settling, we should mention that combined paint, in the gun, should be shaken or

stirred periodically when using the satin hardener or variations of sheen and drying time may be encountered.

**Metal or wood-covered aircraft:** In order to properly prepare the modeler (forewarned is forearmed), we preface this section with a warning. Compared to fabric-covered aircraft, the achievement of a grade-A job on a metal subject requires infinitely more skill and technique. Many new features present themselves. Among these are such typical surface details as panel lines, hatches, and rivets. Weathering techniques, particularly, are much more advanced for metal subjects: it is notable that several acknowledged R/C Scale experts are reluctant to jeopardize their position by accepting this challenge . . . instead, they stay with safe, easy-to-reproduce fabric or wood-covered subjects.

That's the bad news. Now for the good. Whereas the fabric-covered models obliged us to use some materials we'd rather avoid, we don't have this limitation on solid-surface subjects. We can use fiberglass covering and resin finishing materials throughout. Then too, the extra technique shows, and these aircraft have a tendency to look prettier and possess more character.

However, before we get into a detailed description of the fiberglass finishing process, there are two very important areas which need to be handled first. These are fillets and landing gear doors.

**Fillets:** Remember a while back, we mentioned Super Monokote? Go buy a roll—we're going to put it to work!

Here's how to make a truly outstanding fillet which will fit so well that you'll hardly see the seam:

1). Cover the wing's upper surface with the Monokote, from the root rib to a little further out than the width of the fillet. Iron firmly down to the bare balsa, being careful to remove all air bubbles.

2). Mount the wing in place on the fuselage. Lay a strip of masking tape on the fuselage at the upper line of the required fillet and also across the wing at the outer edge of the fillet. Mix a small batch of K & B resin and Prather phenolic balloons, making a thick mix.

3). Add catalyst (straight matte hardener) and trowel into the wing/fuselage junction with an artist's spatula.

4). After about 10-20 minutes, the balloons will reach a "gel" point. This occurs when the material solidifies, but is not fully cured. Later it will get very hard, but at this point it can be cut like soft cheese. Using a knife, coarse sandpaper, or even the blade of the spatula, pare away the balloons to the approximate shape of the fillet.

5). Once you get the feel of this, mix more balloons and proceed until you have both fillets roughed out.

6). Let the fillets harden totally (overnight is best), then sand to final shape and smoothness. Sand to the limits prescribed by the masking tape. Remove the tape.

7). Now the good part. Remove the screws holding the wing. Stand the model on its nose, with a helper holding the aft fuselage under the stab. Holding your hands with flat palms, FIRMLY rap both wings at once near the T.E. The wing will break free of the body.

8). Remove the Monokote from the wings. You now have the best fitting fillet you ever saw.

**Landing Gear Doors:** Having introduced you to the usefulness of Super Monokote as a release agent for polyester materials, we will now use it to help fashion doors.

1). On the wing bottom sheeting, the areas where the L.G. doors are should be marked out and covered with Monokote.

2). Brush a coat of resin over the Monokote and let harden.

3). Lay up and resin 2-3 layers of 10 oz. glass cloth over the Monokote.

4). When cured, sand the outer surface smooth. Prime and re-sand.

5). Break away the fiberglass layup from the wing. Mark out the exact shape on the door and cut to size.

6). Remove the Monokote. Lay the completed door on the wing, noting that it follows every curve or twist, and exactly fits the wing where the door will be in the retracted position. Trace the door outline and cut away the appropriate area of sheeting from the wing. Mount the door on the L.G. leg.

Landing gear doors made in this way, in addition to fitting very precisely, have good strength and cannot be bent out of shape.

There are also other occasions when "the Monokote trick" can be used to engineer very exact mating fits between two parts. Removable cowls, hatches, and flap lines are some more examples. Bring the parts together with the Monokote between them as a barrier, trowel in a little micro balloons each side, sand flush while together . . . then break the part free and remove the Monokote.

Let's move on now to the details of fiberglass covering. At first encounter, this sometimes proves a little messy. As experience is gained, the mess diminishes and you'll enjoy it more. Here's the procedure:

1). Gather the necessary items. You'll need glass cloth, K & B resin, hardener, a #12 artist's hog-hair brush, mixing cups and stirrers. Put some clean acetone in a jar for cleaning the

brush. Get scissors, a sanding block with #220 paper, some paper towels or a toilet roll.

2). Prepare the bare wood with the usual fine-sanding, spackle filling and re-sanding till the parts are really smooth.

3). Cut a piece of glass cloth to fit the section to be covered. No material takes compound curves so easily as glass, so you can cover a large section—half a fuselage for instance—with one piece.

4). Mix the K & B resin 1 oz. at a time. Use 8 drops of hardener. Brush the resin on the cloth. "Pull" the resin as much as possible (make it go as far as you can). Work quickly.

5). When the 1 oz. of resin is used, clean the brush and blot any "wet" looking spots with the toilet roll.

6). As the resin cures (about ½ hour), trim or feather the cloth's edges

with the sanding-block. Proceed with more covering, mixing 1 oz. of resin at a time and cleaning the brush immediately after each mix.

Polyester resins have one slightly disturbing characteristic. They will not tolerate oils, and you'll get an uncured mess if you try to apply them over "oily" substances. These include epoxies, butyrate dope, greasy fingerprints, etc. All epoxy seams should be sealed with nitrate dope, ambroid or white glue and allowed to dry for 24 hours. A rag dampened slightly with acetone should be used to swab the fuselage prior to the resin application.

Also, if any "wet" spots appear after the first coat is applied, sand these to remove the oily skin which characteristically forms as the resin cures. Wiping again with acetone prior to brushing on the second coat is prudent.

7). With the entire model covered, lightly sand and mix a batch of resin sufficient to give an overall "flow-coat."

8). When this cures, sand carefully using #80 or even #60 paper at first, finishing with #220. Resin cuts sandpaper as much as the paper cuts the resin: Replace the aluminum oxide paper frequently. Note: we want to fill the weave of the cloth only. Sand all excess resin, till you can see the weave (but don't cut into the cloth). This is where many first-timers go wrong and get a heavy finish—they don't sand off enough resin.

9). Examine the results critically, and re-resin and sand out any bad areas.

So far, so good. The worst part is over. Now we can proceed to spray on the primer coat. When the primer is cured, sand lightly with #220. Usually, bad areas will now show where we didn't notice them before, due to the color of the primer. Treat all of these areas with more primer. Really deep



6  
dings or holes can be filled with acrylic auto glazing putty. Sand lightly overall.

At this point the model should look really great. Indeed, it needs to, because this is as good as it is going to get. However, the ship still looks bare, so let's add some details to it.

**Hatches:** Cut to size from aluminum air-conditioning tape. Peel off the paper backing to expose the adhesive, and smooth down onto the model, using a nylon prop as a burnishing tool. This material will follow compound curves to some degree, as it is .003" thick and soft-tempered.

**Panel Lines:** Mark out the panel lines directly onto the primed model with a soft lead pencil. Over these, lay 1/64" wide chart-tape (obtainable at drafting or office supply outlets). Use the flexible type (Formaline #5000 A, or equivalent), which will form around flat curves. J & Z also makes a panel line tape.

This tape may be left on the model permanently or (as we prefer) it can be removed again after the model is painted and prior to the final clear coat. This latter method gives a very realistic simulation of panel joints.

**Rivets:** As with the ribs stitches previously described, use Elmer's white glue applied with a hypodermic needle. Note that the glue droplet is held to the surface, which will pull it off the needle—the needle must not touch, or the rivet will lose its roundness and assume a "fried egg" appearance. Thin the glue with water if necessary, but go easy.

**Other Details:** Many small details can be made with micro-balloons. Fairings for antenna masts, streamlined forms on aileron mass balances, air-scoops and blisters are a few examples. Put a blob of mixed balloons and K & B resin in place, and simply carve to shape and sand when cured. Small touches like this take a little extra effort, but they add much to the effectiveness of the finished model.

**Mixing Colors:** We need to begin this section by explaining why an oft-requested item is not available. Modelers frequently ask for "formulas" for certain colors (military shades, for instance). These fellows suppose that if they could have a formula (so-many parts white, so-many blue, and so on) they could match a color without difficulty. The reason that such formulas are not available is that *they won't work*. Minute variations of shade in any ingredient will spoil everything. So would variations of strengths (pigment-to-carrier relationship). No paint manufacturer will claim zero variation in either of these qualities for his product. Consequently, formulas won't work, and indeed it would be a disservice to the modeler to attempt such an idea,

because it would only mislead, rather than serve.

Bearing this in mind, it becomes necessary to custom-mix a batch of paint for any given model. This is not particularly a hard thing to do, given a basic understanding of how colors work.

There are only three primary colors: red, yellow, and blue. Any other color can be made from these. The primaries cannot be made by mixing any colors. Black and white are not colors (they are tones) but we must consider them as essential in color-matching, since tone must be matched too.

Let's give a couple of basic mixing facts and show how these are incorporated to get the color we want:

RED + YELLOW + BLUE =  
BROWN

YELLOW + BLUE = GREEN

YELLOW + RED = ORANGE

BLUE + RED = VIOLET

WHITE + BLACK = GRAY

WHITE LIGHTENS, BLACK  
DARKENS

Simple enough. Let's take an example and see how we'd match a color. Suppose we want to make R.L.M. #75, a *Luftwaffe* color. This is a violet gray. Gray is white + black, so to this we add some blue and red. Proceed as follows: Start with 1/2 can of white. Add a small amount (by trial and error) of black for a pale gray. Add a small amount of blue and a good slug of red (Hobbypoxy H-66 Red *only*). Take samples as you go.

It takes a while to zero in on any color, even a simple one. Small dabs of correction will do once an approximation is obtained. The vital thing about learning to match colors is to *get in there and start!* No amount of hand-wringing gets the job done, but *mixing paint* will. At first, start with small amounts, and plan on spending an evening or two to learn this essential skill.

In some ways, this is a more difficult subject to describe than any other, since it is essentially a visual process. We'll give one more example, and leave it for practical experiment by the modeler.

**R.L.M. #76:** Start with white. Add black to get a pale gray. Add a little blue, resulting in a pale blue-gray. This color has a faint greenish tinge, so we need to add a small amount of yellow (which, combined with the blue in the mix, will send the color in a green direction). So we see that #76 consists of four paints. Use *only* a lemon (blue) yellow—a chrome yellow will prevent a proper match, due to the red inherent in the yellow.

**Painting The Model:** Assuming that we have mixed the required colors, and

have a supply of Part A for each color in the model, let's proceed to painting. We are going to use the example of the Me 109 to show the order of procedure.

One basic tenet that holds true in any paint job is that lighter colors are applied first. This being so, spray the underside and fuselage sides with #76.

Next, apply the #75 (the lighter of the two upper surface colors) over the top of the wings and stabilizer. Also apply #75 along the upper "spine" of the fuselage. All divisions between the lower #76 and upper #75 should be a fairly "hard" (but not masked) line.

Now the fuselage sides are faintly mottled, here and there, with #75 over the #76. Choke the spray gun delivery down until a soft effect is obtained . . . we don't want "blobs." Do the fin and rudder in a similar manner.

When the #75 is satisfactory, proceed to the darker #74 upper color. Do the wings first. Following the plans carefully, "draw" the outlines of the #74 areas with the spray gun. Fill in the #74 areas between the lines with paint. Here again, although we don't want a firm line such as masking would give, neither do we want a merge from the one color to the other. The correct effect is obtained by aiming for the "hardest" division possible with a spray gun.

Do the stab next, then the #75 areas of the fuselage spine, and finally a light mottle on the sides among the #75 mottles already there. To get the idea of the shape and size of realistic mottling, copy a photograph of a full-size 109.

Once the model is painted to this point, *lightly* sand it with wet #600 paper, using plenty of water. This will remove the tiny "spikes" of dry paint or any powdery areas. Do the wings and stabs in a chordwise direction, and the fuselage up and down.

**Markings:** There are basically two methods of applying markings: they can be painted right onto the model, or they can be decals. We could further subdivide the decals and say that there are two kinds: the traditional "water-slide" variety, and the vinyl or mylar stick-on type.

This is, of course, purely a personal opinion, but we feel the stick-on decal is fine only on a ready-to-fly .049 toy-store U-control model. It has no place on a good scale model . . . a vinyl decal will seriously damage the appearance, no matter how good the rest of the model may be.

The ordinary water-slide decal (a vanishing breed) is okay for most purposes, and has the great virtue of being quick. There are a couple of things to watch out for with decals:

A). Sometimes they are printed "out of register" (one of the colors is mis-

placed in relation to another.) This is uncorrectable usually, and the sheet must be discarded.

B). It is possible that our final clear coat may react with the decal, causing it to wrinkle, craze or blister.

But, assuming we don't have either of these problems, a water-slide decal will be fine. They need care in application. Here are a few hints:

1). Soak the decal briefly in water. It probably will curl up. *Don't* attempt to straighten it out: you'll crack the decal. It will flatten out by itself as the water impregnates the paper more fully.

2). Moisten the area on the model where the decal will go. Slide the decal into place and adjust position.

3). Squeegee out all trapped water using a piece of wetted soft balsa. Sponge clean and dry.

4). Allow *at least* 24 hours for complete drying before overspraying with paint.

One very good system (we provide this in our kits) is to use plain-color water-slide decal paper. This has the great advantage of flexibility . . . you can cut the markings you want for your chosen version, and not have to settle for the identical markings that every other buyer of that kit received. A secondary benefit of this idea is that there is no clear carrier-coat that must be trimmed away.

We saved painted markings till last because this, we feel, is the best method of all. Certainly, it is the chosen method of the experts. There are two excellent reasons for suffering the extra work and time taken to paint the markings on. First, paint follows any shape, compound curve, goes over rivets, etc.—decals can be a nuisance here. Second, the markings can be weathered along with the rest of the model. You can't do *that* with decals!

Earlier, we mentioned a product called "Liquid Masking Film." This is made by Fliteglas Models (run by Ralph White, himself an expert scale modeler and Nats winner). The use of this material will give you the cleanest, most precise markings possible. The directions included are quite complete and we can't do better than suggest you do it like the man says. Perhaps the best recommendation we can give to L.M.F. is to say that this is what we use on our own models.

If you have stayed with this rather lengthy story this far, relief is in sight! Our last chapter deals with that most mysterious and baffling of all arts . . . weathering.

*Weathering:* Alright, we've built it, covered it, sanded and sanded and sanded it. We've painted it, and put the markings on. Sure looks like a finished

model . . . it isn't. One vital ingredient is missing: one that controls the final effectiveness of the model.

This ingredient is "character." If we forget this, our nice models will always be just that—nice models; nothing more. We must somehow capture the dignity of this machine. Sounds a bit romantic? Well, perhaps it is. But if we can at least be *aware* of this mysterious something that radiates from an airplane, we are on the road to creating a work of art that transcends the model and becomes a true replica. Let's discuss how we might inject this "character" we've spoken about.

An airplane is a tool. It's a tool for doing a specific job. That job may be to carry passengers, or its owner from point A to B—in this case it's a vehicle of transport, like a car. Or the job could be to destroy—to drop bombs, shoot up or shoot down the enemy's tools. Because an airplane is a tool, it is subject to the same treatment as any other tool: a whole lot of abuse, and a whole little of respect. It's called upon to do its designed job (and often more than it was designed for) with unfailing willingness and reliability, coupled with the barest minimum of essential care and maintenance.

Let's itemize some of the effects that this love and attention have on the appearance of an airplane, and also some other inevitable effects that are not man-made. These are, in order of importance:

1—Color perspective; 2—Usage; 3—Mechanical; and 4—Weather.

Did you notice something unusual about this list? The adding of realistic effects to a model is commonly known as "weathering." Yet, we are asking you to believe that not only is weather just one of *four* major factors affecting airplanes, but that it's the *least* in importance! How come? Let's take each item singly and the answer will be revealed.

*Color Perspective:* Stand by a tree. We can see that the bark is brown and the leaves are green, basically, but there are many shades of each. Now move away 100 yards and look again. Right away, the varied shades have disappeared, and the trunk is plain brown, while the leaves are overall green.

Move another quarter-mile, and we see a much more even color throughout—the brown seems less brown, and the green less green. As a matter of fact, it would be difficult to tell just what color a tree is at this distance, if we didn't already know from prior experience.

Move away again—now the tree is on the horizon a mile-and-a-half away. The color of the tree is now a medium gray all over, with no discernible color

distinctions.

This effect is known as color perspective. It happens because the air we look through is neither as clean nor as transparent as we think. Between our eyes and the tree, there is airborne dust in untold quantities. That dust is gray, and it acts like a giant diffuser.

What difference does this make to our scale model? Consider this: looking at a 1/8-scale model from 10 feet is the same as looking at the real plane from 80 feet away, right? Wrong! It's wrong because, when we look at the big one, there is eight times as much atmosphere between our eyes and the real plane, as there is between our eyes and the model. This has the effect of toning-down the colors on the real plane more than those on the model.

We must compensate for this "visual scale distance." We do it by giving the model an even and *very light* spray-coat of medium-gray after the color-scheme is completed and all markings are on. The coat should cover all surfaces, including the glass areas.

Color-perspective gets first place on the list because it is the most inevitable. Even a model of a so-called "factory-fresh" and unused airplane is subject to this universal law. (Having mentioned the words "factory-fresh" let's explode another myth. Many times a builder of a glassy scale model will excuse himself by falling back on the old saw that his model represents a "factory-fresh" airplane. So how, one asks, did it get squadron markings and crest, and a victory tally?)

*Usage:* Chronologically, the next appearance changes to a full-size plane are caused by usage. We can sub-divide this category into these major items: A) Dirt and grime, B) Paint chipping and scratches, C) Oil and fuel stains, D) Burns, and E) Damage.

Dirt and grime are best represented by careful and *very soft* sprays of dark charcoal gray on the completed model. Remember that dirt normally follows the line-of-flight. Thus, it will form behind protuberances on the aircraft and diminish as the distance from the protuberance increases. Panels of slightly unequal levels, e.g., along wing, stab and fuselage sheeting joints, also show the effect to a lesser extent, especially those perpendicular to the line-of-flight.

Simulate paint chipping and scratches with silver paint on a small stiff haired brush that has been scrubbed on a piece of scrap paper until almost dry. Then jab the brush on the model to leave irregularly-shaped wear marks.

These marks most commonly occur at the places where the crew enter the plane and where mechanics perform routine work. Fuel fillers, ammunition

bays and inspection hatches gather wear of this kind in an unbelievably short time in use—especially military use, where a proud owner is not around to moan about the smallest ding! Keep the silver where it belongs. We don't want the model to look like some full-size plane that got left out in a sandstorm.

Oil and fuel stains are best applied by rubbing the model at the appropriate places with some staining agent on a soft cheesecloth.

Burns form around and behind exhaust pipes. Soot from the exhaust sometimes marks an aircraft for several feet. Use near-black or fawn. You might want to browse in the model railroad department at the hobby shop. There are commercial stain colors used to weather trains.

Before applying exhaust burns, find out whether marks of this kind are characteristics of the type of plane: Skyraiders always mark, Spitfires seldom do.

This brings up an important point. Study as many photos as possible of your subject. Look "through" the jazzy schemes and study the usage marks, noting which ones seem to occur consistently. Concentrate on these.

Damage, of course can happen anywhere and to any degree. This is impossible to detail. Just use your imagination. But go easy.

**Mechanical:** Mechanical causes of significant appearance changes can be broken down as: A) Repairs, or B) Holes.

Repairs to an aircraft typically take the forms of patches on damaged metal or fabric. Very often, patches on metal

structure have fresh paint applied, which shows as a sharply contrasting shade of color, even when the colors are "the same." Patches in fabric may have the same treatment, or can be painted in red primary-dope, which often is left just this way. It was not uncommon to encounter airplanes with dozens of such red patches in war time.

Imagine this situation: Someone decides to add some device or other onto an airplane, and goes ahead and bolts it in place. Later, it is decided to remove the gadget. Do you think that they then bother to fill in the holes after removing it? No way. Here again, use your imagination—but, once more, don't over-do it.

**Weather:** So, finally we come to weathering. We say finally, because the other things described previously have a rapid effect on the appearance of an airplane, whereas weathering takes time. Even then, the effects are subtle, and a good deal of caution is necessary here. The visible effects of weathering are: A) Fading, B) Cracking and peeling, and C) Rust and other corrosion.

All paints fade, in time. Under certain conditions, such as continued exposure to strong sunlight, noticeable fading can happen in two months.

We simulate fading with a very light coat of pale gray, sprayed from a distance and in merging formation. The upper surface of the wings, stab, and top of the fuselage fade more rapidly than the sides of the fuselage and the fin; while the whole under surface scarcely changes at all.

Cracking and peeling are best done by flaking off the odd area of paint with a knife. Here's another trick: after

spraying the color dope and before it has a chance to cure properly and become fuelproof, rub in some fuel on a rag. The paint will lift and flake off.

Rust is easy. Simply buy a pot of Rust enamel from the hobby shop (sold for model railroad use) and paint it on. Don't use too much—tatty and beaten airplanes may be, but rusty they aren't. The odd spot here and there is all you need.

**Tools:** Let's finish up with some remarks about the "tools of the trade."

Really, apart from masking tape and the usual stuff found in any modeler's workshop, there is only one tool. This is an airbrush . . . a really good air brush. The type of "airbrush" that has a hole which you block with your finger to spray, then release to stop, is fine for plastic models, but it will not do for really intricate detail.

What we need is an airbrush which has a trigger that is controllable by a screw, so that we can adjust the flow for more or less paint. Get the right kind of airbrush and it will serve you well. Such brushes are not cheap—ours cost nearly \$100.00 (without the compressor).

The compressor should be fitted with a water trap, or you will be forever blowing out the water which forms when air is compressed. Usually, high-humidity conditions and/or small nozzle openings aggravate this problem.

As with any new-experience area of modeling, mistakes will be made, and first results are far from good. But persistence will eventually be rewarded.

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