

# REVISION LIST

## CHAPTER 28: FINISHING TECHNIQUES

The following list of revisions will allow you to update the Legacy construction manual chapter listed above.

Under the “Action” column, “R&R” directs you to remove and replace the pages affected by the revision. “Add” directs you to insert the pages shows and “R” to remove the pages.

<b>PAGE(S) AFFECTED</b>	<b>REVISION # &amp; DATE</b>	<b>ACTION</b>	<b>DESCRIPTION</b>
28-1 through 28-4 28-5	0/02-15-02 1/09-18-02	None R&R	Current revision is correct Text Correction
28-1	3/12-15-04	R&R	Updated table of contents with page numbers.

# Chapter 28: Finishing Techniques

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## 1. INTRODUCTION

### Painting and Interiors

The final look of your airplane is obviously an important aspect. It will affect performance but its primary effect is on ones ego. Luckily, it is not difficult to achieve an attractive finish on your Lancair, after all, you're starting with the best looking airframe in the air! Some very simple hints and techniques are all it will take.

## 2. PARTS LIST

A variety of finishing material/tools are available through KCI.

**Note:**

**Optional Parts available through :**

**(\*) Lancair Avionics**

**(\*\*) Kit Components, Inc.**



28-1	Chapter 28	REV.	3/12-15-04
FINISHING TECHNIQUES			

### 3. CONSTRUCTION PROCEDURES

#### A. Bid Tapes

- A 1.** The BID tapes that are applied to the exterior joggles will naturally require the most finishing and a little blending.

One simple trick in starting the process off is to apply an epoxy/micro blend (heavy on the micro here) to the tapes within just a few hours of application. When the tapes are still tacky, mix up a small batch of micro and apply it to the joint area. Be sure that the tapes are set up enough that you won't disturb them with the application of micro. Of course, you can always wait until they are fully cured, that's perfectly acceptable.

You'll probably find that it is a good idea to perform the basic finish on the BID tapes as you progress through the assembly of the airframe as opposed to waiting until all the glass work is completed and then starting on the finish. If you break it up a little, the task will seem much easier and in fact it will be easier.

- A 2.** As you are progressing through the assembly processes, you will usually have some excess epoxy mixed up from time to time and it should not be wasted. Simply mix it with generous amounts of micro and find a BID tape somewhere that can use it.

#### B. Mixing Micro

- B 1.** When you are applying the initial micro to an area, you should mix it quite thick. Thick means LIGHT and inversely thin and runny means HEAVY. The thick micro should have the consistency of bread dough (or perhaps just a *little* bit less thick. Next, you might experience a bit of difficulty in the application of this thick micro. It may want to roll up behind your squeegee. If that proves to be an unsolvable problem, then perhaps it is just a little too thick, thin it back down with a little more epoxy. (But, always premix the epoxy thoroughly before adding it to an existing batch of epoxy/micro.)

One final method of evaluating the micro blend is by its sheen. If it smoothes out, sags or runs on vertical surfaces and/or achieves a nice smooth shiny look to it as it sets up, then it definitely is too thin. You can usually determine this quickly after an application since it will quickly smooth out and get shiny on the surface. If you see that, then you will still have time to remove it and add some more micro to the mix and reapply. Generally, one or two applications will be all that is required to "get the hang of it." And, that's why it is best to start with small areas first so if you didn't quite get the blend figured out, you won't be stuck with large areas to deal with.

- B 2.** In general, the first applications of micro will be the thickest mixture. As you apply a second coating for "fine adjustments", the mixture should be somewhat thinner since you don't need much "build" and you don't want to trap any air bubbles in the mixture. Any trapped air bubbles, if they are too large or too close to the surface can result in popping the paint loose in that small area as the air in the bubble heats up, expands and loosens you sure don't want any shiny bumps in your otherwise smooth paint job.

- B 3.** When you're ready to first sand the micro, use a 50 grit paper on a long board. These "long boards" are available in any auto body repair shop and use the standard 3" x 14" sanding sheets. It's a good idea to buy a pack of 50 grit and 80 grit.

- B 4.** You should always sand on a 45-degree angle to the contour and run the sanding board in a bit of a diagonal direction. Also, change directions of stroke regularly so that you achieve a nice smooth transition across the BID tapes thus not generating any grooves or waves.

- B 5.** If you start with a 50 grit sandpaper, you should only use that to get the lumps and bumps off of the micro, then switch to an 80 grit to get down to a nice smooth blend. Any second applications of micro will usually be best treated with 80 & 120 grit.

- B 6.** A small 3" x 6" sanding block is also quite helpful as is a "half round" sanding board. The half round is used along sharply rolled surfaces like the wing to fuselage joggles, etc. The half-round sanding boards will use 1/4 of a standard sheet.

- B 7.** The pressurized fuselages need to have a 1 BID layup of fiberglass applied over the thick micro areas, around the door area. We have noticed our micro around the door and fairing area is experiencing some cracking. The carbon can take the loads but unfortunately the micro alone cannot take the stretching. Again the micro areas that are over 1/8" thick should have one layer of glass applied over it.

- B 8.** With micro well dressed over the BID tapes, etc., you're ready for primer.

#### C. General Surface Preparation

- C 1.** As mentioned above, the general means to attaining good smooth transitions is with micro. Small spot touch-ups can be made easiest with the light weight body fillers available in auto supply stores. Use only the light weight types (typically about 5-7 lbs. per gallon), these will have micro balloons mixed into them already - but to a much lesser degree than with out epoxy/micro. This type of filler should NOT be used in large amounts, but only for small touch up areas. It dries very quickly and thus allows for final prep on a fast basis.

- C 2.** To achieve the best possible adherence of paint, all surfaces should be cleaned with a suitable cleaner to remove dirt and oils. After cleaning, sand the surfaces with 80-120 grit prior to applying any primers. The best filling primers are of an epoxy basis. Lacquers should generally be avoided. Some Polysters are acceptable, however, they will shrink and the shrinkage will eventually allow imperfections to show through the finished paint job. Again, epoxies are highly recommended.

We have tested a wide variety of filling primers. Sure, there are many excellent types available that we have not had the opportunity to test out, however, generally stocked by KCI, consult our options catalog.

## D. Priming Materials

The WLS system is a two part epoxy system and can be reduced by up to 10% for thin applications. When applying the last coat of primer, it is generally best to thin it. Thinner / reducer is supplied with each WLS set.

- D 1.** The first application of primer is primarily to fill the small depressions in the weave. These are very shallow and are very small. It is generally effective to first squeegee or brush a filling primer onto the surfaces. This helps get the material down into the tiny depressions.

If you were to begin by spraying a heavy application of filling primer onto the surfaces, it would tend to bridge the small depressions but, when sanded back down, the bridging would be sanded away and the depressions would reappear. A spray technique that does work satisfactorily is to spray a very light coat and allow it to set up a bit. Follow with another very light coat. These coats should be so light that it requires about four passes to get a solid color change. Then allow that to cure. This process helps allow the filling primer to get into the depressions and exclude the air that must be displaced without causing any bubbling on and allow it to set up a bit. Follow with another very light coat. These coats should be so light that it requires about four passes to get a solid color change. Then allow that to cure. This process helps allow the filling primer to get into the depressions and exclude the air that must be displaced without causing any bubbling on the surface. If you see any bubbles occurring, it is because the primer is displacing small amounts of trapped air, which causes a bubble in the too thick application of primer.

- D 2.** After the primer cures, use either a machine sander or sand by hand. Start with 120 grit and progress up to 150 grit for this sanding. (If you are careful, you can speed the process by starting with 80 grit, but don't sand with that course of a paper too long or you'll not have anything left to sand with the finer grits.) This sanding will go quite quickly since you are not doing any contour work, just knocking down the primer. We generally will sand an entire wing surface down in about 30-40 minutes. An air driven 8" dual action sander (DA), and the air file (long board 3" x 14"), will work the best. The 6" orbital sanders will take much more time and leave hard to fill sanding marks. The 8" DA will require a 2 hp compressor, which it will work pretty hard, and it usually can just keep up with the air demand. Keep the sander moving and use a similar diagonal motion so that no grooves or waves result.
- D 3.** You should sand this application down until you just begin to see the prepreg starting to show through.

**NOTE:** It is very important to keep the primer applications THIN. Excess amounts of primer could easily increase the weight of your aircraft by as much as 30 lbs. Also, remember that the goal should be to achieve a finish on the bottom surfaces that is conducive for good aerodynamics *only*.

- D 4.** With that first application of primer sanded down, go over the surfaces and look for imperfections. Use a spot light at a low angle to the surfaces in a dark room to quickly point out any imperfections. You should use compressed air to blow off the surfaces first. Wiping them will leave sanding material down in any imperfections that may exist, and you'll miss seeing them.

- D 5.** Spray a second coat of primer. This coat can be a thinner application. After curing, sand it down with 220 grit. You can either wet or dry sand. If you wet sand, the sandpaper will not tend to clog up (use 3M wet / dry - black sandpaper). However, with wet sanding, you should allow at least one to two weeks for the surfaces to fully dry before painting. If you dry sand, use the aluminum oxide sandpaper (light grayish color).
- D 6.** If you are intending to use a urethane type of paint, then generally a 220 grit finish is acceptable as a paint base. If you choose an acrylic / enamel type of paint, you should go to a 360 grit finish since it will show the scratches more readily than a urethane.
- D 7.** The second coating of primer should also be sanded down quite thoroughly. If the prepreg begins to show through, touch-up with a spray of primer and lightly resand. This will assure the thinnest possible primer coat, yet allow full coverage.
- D 8.** If you have some (few) imperfections located after everything else is readied for paint, limited use of a lacquer spotting putty is acceptable. This should be used sparingly. It is packaged in a tube and will set up in about 20 minutes. Use a small squeegee to apply it, then spot sand with 220 grit. Make sure that it is feathered out nicely or else an edge will result and show through in the paint. The two part spot putties, or glazing compounds, are much better though and will set up equally fast. This is not intended to be a painting instruction, we will only touch on a couple of basics. You should consult local sources or available technique books for tips on painting.

## E. Paint Preparations

- E 1.** It is recommended that the airframe be disassembled as much as possible more pieces but a better paint job when it's all put back together.
- E 2.** Remove the control surfaces, gear doors, wings, door and cowling. Mask off all appropriate areas. Tape off the gear wells and wrap plastic bags around the wheels. If you roll the plane up onto some stands, the lower surfaces of the fuselage will be easier to spray but be sure that you can still reach the top or have a stool available.
- E 3.** Blow off everything with compressed air and be extra careful to blow off areas that are near any possible spray gun blast. Even if some areas are not destined for paint, such as, the gear wells, back by the flap attach locations along the aft spar webs, etc. Sometimes these areas can have big cakes of dried sanding residue that is just waiting to be launched into the air when your spray gun hits it. And that can make a huge mess on a nice clean, wet paint surface. Also, check the hose, near the area of the spray gun, since it will likely be suspended over some wet paint as you make your spray passes.
- E 4.** Wings, control surfaces, etc. can be hung on wires or clamp up to make-shift fixtures. Again, be sure these fixtures are also dirt free. Use recommended surface cleaner (prep-sol, etc.) and tack rags to remove any contaminants.
- E 5.** It's not easy to paint all surfaces at the same time but it is recommended to at least mix all the paint cans so that the color is guaranteed to be identical from one gallon can to another.

Generally, three gallons of top coat paint (plus its recommended thinner and catalyst, etc.) is sufficient. So, mix the two-gallon cans together by pouring them into a bucket, mix them and then pour them back into their own gallon cans again. Even though the colors are supposed to be the same, they often have slightly different hues from one can to another. Whites are particularly susceptible to this problem.

## F. Painting

- F 1.** Generally, the urethane paints are preferred. That is because they will allow the greatest amount flex without cracking or chipping. You will generally use less spraying volume with these, but they are heavier with less evaporative solvents. So, the weights come out about the same in the end. Imron is the most readily identified name brand but there are several excellent brands available such as, Sterling and Ditzler.

Another acceptable type is the acrylic / enamels. These, when used with the catalyzed hardeners, produce an excellent finish. One such paint type is DuPont's Centari. Often, the acrylic / enamels are easier to touch up and blend in with the existing paint finish. The urethanes often do not blend very well together when making

any spot repairs. On aluminum (rivet-bucket) aircraft, that problem is more easily dealt with since you can mask off individual panels. But with our composite airframes, there are no "panels" since all parts are blended into one another. Thus, there is simply no convenient place to stop a spot repair short of an entire wing surface or fuselage.

- F 2.** A word of caution, when preparing to paint, be sure to read the safety instructions and follow them carefully. The fumes from these paints can cause serious harm or death.

## G. Base Colors

- G 1.** Keep your color choices to **LIGHT** pastels **ONLY**. Yes, you've seen other darker colors on aircraft and one of our company planes has had a darker color but that was for a testing program and **IS ABSOLUTELY NOT RECOMMENDED. In fact by policy, we prohibit dark base colors on all Lancairs.**

Yes, our Lancair materials are better suited to higher thermal tolerances but as with all composites with any type of resin system, strength will drop as temperature rises.

The biggest difference with Lancair materials involves the core materials. Our high temperature cores will not sustain any permanent damages from elevated temperatures, but the common low temperature cores would. Our materials will tolerate elevated temperatures without any permanent damages, but, as with all resin systems, a temporary strength drop will result as temperatures rise. This temporary drop reduces the effective safety margins until the composite cools.

When it cools, all strength will return. But, due to this temporary, potentially in-flight drop in margins, we only recommend light pastels for a base color. We cannot stress the importance of this enough. Keep your colors **LIGHT** and let us do the testing.

However, with your Lancair, you can enjoy a much wider color choice than any other kit plane on the market, since all the vinylester / low temp foam kits should **ONLY** be painted white. Any other color choices (even light pastels) could run their expected surface temperatures too high thus causing permanent structural damages. This will never happen with your Lancair and it is just one of the many reasons why we have chosen these superior, high temperature advanced composites for the Lancair. That is also one of the key reasons why virtually all of the commercial composite industry uses **ONLY** high temperature epoxy based composites for airframe applications.

## H. Trim Colors

- H 1.** There really is no problem with any of the trim colors provided you keep them down in size. It is recommended that you do not paint any trim on the fwd 50% of chord along the wing. This is because the resultant paint edge, even though it might only be .010" thick, could trip the laminar flow and cause added drag. Fwd / aft orientated wing tip striping is however acceptable.
- H 2.** Generally, the trim is painted onto the airframe after the base coat has been applied. Usually, the simpler the trim design, the better it looks. Designs that have a lot of vertical direction changes within them generally tend to break up the smooth flowing lines of the Lancair and detract from it in the process.
- H 3.** It is highly recommended that you use the 3M type "fine line tape" for masking the paint areas. This should be used for the base coat colors as well, such as around the canopy and windows, etc.

This fine line tape is usually found to be slightly greenish / gray in color and of a mylar type material. It is much thinner than the masking tapes and produces a very nice, crisp line.

**WARNING:** When you are finished with the painting, etc., be sure to check your **pitot** and static ports, especially the static. Verify that it is still clear and functioning, as primer and paint could plug it up. Also, check the balance of the rudder and ailerons to make sure they are perfectly balanced.