LOEHLE COATINGS

WITH LOEHLE *ULTRA-FLEX* TECHNOLOGY

Procedure Manual

Fabric Covered Aircraft
Metal Aircraft
Composite Aircraft
including
Vans RV Painting Article

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Loehle Coatings

$20 US

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We would like to introduce our ***LOEHLE COATINGS*** process…

Our system utilizes the most advanced chemical technology available today and features **LOEHLE *ULTRA-FLEX* TECHNOLOGY**. Our system is based on ***modern*** urethane chemicals and produces the ultimate in very high gloss "wet looking" finishes. Our unique system even allows for the use of a special, crystal ***Clear Top Coat*** that produces a very rich, deep looking protective coating.

LOEHLE COATINGS have been developed over a period of nearly 45 years. The chemical components have been formulated to work on all types of aircraft and custom cars. They are designed to be applied on fabric covered, as well as composite and metal aircraft. They are presently only for amateur built aircraft. Even though our coating process is not yet certified, the goal is to eventually make them available for antique fabric restoration shops and fixed base operators globally.

Our system was designed to ***eliminate as much work as possible*** for the amateur builder. We utilize chemicals that are designed to cover in as few coats as possible… the days of being required to spray on ***35 gallons*** of chemicals to cover a Piper J-3 Cub size aircraft are now over! No longer are builders required to spray ***10 + coats of filler*** on all surfaces ***BEFORE*** applying the color coats… 1 to 3 coats are all that are required with our process!

Our special ***UV Blocking Primers*** have been designed to fill or build up mil thickness quickly.

They dry fast and do not require anti-blush additives. Humidity is virtually not a factor. Blushing (turning white) of urethane chemicals is unheard of. They have been formulated to block ultraviolet radiation and are very opaque. Sun rays are blocked from passing through the chemical coatings. This keeps the rays from harming the fibers of the polyester fabric.

At first glance, modern urethane chemicals seem somewhat more costly than old nitrate, butyrate and vinyl based chemicals. When comparing costs though, urethanes are much thicker than older chemicals and are thus designed to be applied with fewer coats. They do not require a tremendous amount of thinner mixed with them to be sprayed. Since they go on much thicker, they do not need to have coat after coat of chemical sprayed on to get the required mil thickness for a proper job. Much less chemical is used because of this. One spray coat of our system is roughly equal to 3 spray coats of older type chemicals. Also, our ***LOEHLE COATINGS*** process gives the builder a **FULL** gallon of ***UV Blocking Primers and Top Coatings*** instead of a gallon can that is only filled up to the 3/4 mark. All our gallon cans are a full gallon. Once mixed, our ***UV Blocking Primers*** are actually 1-1/2 gallons of chemical. So in the final outcome, the cost our system is similar to other processes on the market. (while actually saving you money in the time involved to apply it).

On fabric covered aircraft, a thinned coat of ***Black UV Blocking Primer*** is brushed on bare white fabric. The immediate color contrast of black onto white is very noticeable and assures total coverage. This first coat basically encapsulates the whole structure.

In addition to all these benefits, the ***UV Blocking Primers*** have been specifically designed with sanding aids to produce a shiny finish when they are dry. This allows the finish to be dry sanded. Smooth areas turn to a flat, dull finish and allow rough areas to become very noticeable. Any "shiny" areas simply need additional sanding. Also, the whole process is designed to be ***sanded only one time***… just before applying the ***Color Top Coat!***

Another unique feature of our ***UV Blocking Primers*** is that they come in black and white colors. The use of black pigment is perfect to help stop ultraviolet radiation from reaching the polyester fabric. Only 1 to 2 coats of ***Black UV Blocking Primer*** is required on fabric covered aircraft. A coat of ***White UV Blocking Primer*** is then applied. The sanding process of most covering systems is often tedious and it becomes really easy to sand down through their fillers right into the bare fabric.

Our process allows our white coating to be sanded easily, but as soon as any black coating starts to show a builder knows to stop sanding. This is very easy to see! ***No more bare fabric spots*** with our process.

A white coating just prior to applying a ***Color Top Coat*** is the ultimate method if one wants the most vivid, bright finishing colors. Some companies even recommend the addition of a white coat of paint to be applied their silver and over the entire aircraft before applying the color coat!! We feel this is a great deal of extra work and expense, not to mention that most color coats are not designed to be sanded very much. Normally they are very thin. We simply designed our process to incorporate the use of white color. Other companies have now imitated our process.

Another point to consider is that our coatings are very durable. They are highly resistant to chemicals such as gasoline, paint thinners and even Methyl Ethyl Ketone (MEK). We can't imagine having an aircraft on which the paint comes off or is permanently destroyed by simply spilling something on the finish!

As previously mentioned, our process can be used on aircraft that are fabric covered or made of metal or composites. The chemicals are designed for the maximum possible flexibility known today. This is what we refer to as **LOEHLE *ULTRA-FLEX* TECHNOLOGY.**

Our process basically consists of the following steps for applying chemicals to fabric, composites or metal surfaces:

Step 1. Prepare the surface for paint.

Step 2. Brush on 1 thinned coat of ***Black UV Blocking Primer*** (only for ***fabric*** surfaces).

Step 3. Spray on 1 – 2 coats of ***Black UV Blocking Primer.*** The second coat of ***Black UV Blocking Primers*** is optional. Ultralight (microlight) aircraft and ***metal aircraft*** can skip these steps and proceed with a single coat of ***White UV Blocking Primer.***

Step 4. Spray on 1 coat of ***White UV Blocking Primer.***

Step 5. Sand ***White UV Blocking Primers.***

Step 6. Spray on ***Color Top Coat.***

Step 7. Spray on ***Clear Top Coat.***

It really is this easy… We designed the whole system to allow priming, painting and clear coating to be accomplished all in one day!! You can even wet sand and buff all our coatings that fast too!! Great for custom "street rods" and cars too.

Here are some frequently asked questions and Mike Loehle will answer these…

How long have you folks been working with paint processes for aircraft?

I first started working with paint on aircraft in the late 1970's. My first covering job was on an Easy Riser hang glider using old-fashioned nitrate and butyrate dopes. The fabric was available in a few basic colors, but basically white or light yellow was common.

The first "real" paint I recall applying was on my own Easy Riser and it was trimmed with automotive Dupont Centari™. Most trim colors were sprayed on with aerosol spray paints from the local hardware store in those days.

The first production aircraft paint jobs I did was ***attempting*** to keep paint on the leading edges of 6 twin engine Piper Aztecs that were used daily for charter work. Battling with rain and ice was a constant problem. The paint was Dupont Imron™… my first exposure to polyurethane paints. It was almost love at first sight… I realized this paint would **SHINE** if applied properly.

The only real problem is that I and others had trouble making the color top coat adhere to Dupont's special primer. After much experimentation and being blessed by a pro vocational school mentor, I found that a light coat of zinc chromate primer worked much better. The leading edges required a lot less touch up after this.

I worked awhile fabricating and painting permanent industrial magnets with Dupont Centari™ and really learned to apply metal flake silver pretty well. Silver is not a very easy paint to apply and achieve a high gloss finish… any extra paint and the flakes turn basically to a black streak.

Possibly the first high gloss painted ultralight to arrive at Oshkosh was my black Aeroplane in 1981. The machine was very unusual and shined brightly, while the industry standard was to use flat looking butyrate dope for finishing. Many folks wanted to know what in the world I had finished the Aeroplane with and in the years following, paint jobs started to become shiny on ultralights. (This aircraft won the Grand Champion and Outstanding Craftsmanship Awards that year… and again the following year won the Grand Champion Award at Sun'n Fun.)

The first prototype "5151" Mustang was finished in a mixture of chemicals with the primary one consisting of MARTIN-SENOUR™ acrylic enamel. It was later repainted with a high gloss look using my own mixture of chemicals.

The blue and yellow Paul I "5151" RG Mustang kit prototype was finished with my own mixture of urethane chemicals and was our first aircraft that utilized a totally clear liquid coating over the color coats. This was also the first clear coating we ever heard of applied over vinyl graphics. They were just starting to appear in the light aircraft industry. It was said that one could not clear coat over these… sure has worked well since 1989 for us. The aircraft received the Best Commercial Lightplane Award that year at Sun'n Fun. Most folks clear over everything now.

This aircraft was also featured on many magazine covers.

In 1991, our new Sport Parasol ultralight design was introduced and featured my mixture of chemicals on it. The aircraft was gloss black and International Orange… and it also featured my special clear coat process. This aircraft won the Honorable Mention Award at Oshkosh in 1991.

In 1993, we debuted our P-40 Flying Tiger, complete with my urethane finish and crystal ***Clear Top Coat.*** It was also featured on numerous magazine covers and even calendars. 10 years of hard airshow display work and it still looked really good… many folks thought it was recently finished!

What is the weight of your system compared to others?

We have covered many aircraft over the years with virtually all of the systems that are or have been on the market. We find the only real difference in the approximate weight added during covering and/or painting is the amount of chemicals applied. What we're really trying to say is the actual mil thickness of the coatings. Good quality, nice looking, high gloss finishes really need to have more mil thickness of fillers and paint than a super lightweight job. Most of these lightweight (thin) jobs look unfinished, and have a dull look to them. Our finishes are very comparable to all the other brands we've worked with, once a top notch, high gloss finish is the goal. The actual weights per square foot of our process have never been analyzed, as we have never really been concerned with it… we just know they all are similar. Note that our chemicals shine even if a builder applies very little. It is almost impossible to get a dull finish with our urethane coatings because of their very nature… especially our ***Clear Top Coatings.***

One additional note to remember is that when an aircraft is completed, what a builder and his airport friends see when they open the hangar door is the finish on the plane. At that point, we would much rather have a plane that ***"still looks like the paint is wet"***, than one that folks think is unfinished! We've heard builders say many times that they really don't care how the plane looks when it's finished… they just want a cheap paint job, so they plan to use the minimum amount of paint. We **guarantee** they will regret this decision. We've done both kinds of paint jobs and first class chemicals are the only way to go. We'd leave off the latest "electronic gizmo" that will be outdated in a couple of years, if we wanted to save money… but not on the finish!

How long will your system last and what about dulling and cracking of the finish?

Numerous brands of covering systems are on the market today. All appear to be good systems… some more user friendly than others. Some state that their system is the ***only*** system to use… well we're not sure they aren't exaggerating that statement a bit! Some say that their paint system is the ***only one that will not crack*** with age. Quite frankly, these statements are sometimes more myth that reality. All paint coatings age and dry out…

First off, we've never seen any paint system that does not age and or show signs of slight cracking as the years go by.

We've never seen any paint process on cars, boats or houses that lasted forever. Can you imagine that your car's paint would look brand new after 20 years? Some companies want you to think that their system will allow your aircraft to still be perfect in that amount of time. Well, we've never seen proof of these tales… all systems age. Believe me, we've studied aircraft finishes for many years and inspected many planes. One of our goals is to provide the best possible look, with the least possible signs of aging and for the longest time possible. But sun and weather do take their toll after a period of time. Fortunately, most planes are now kept in hangars. In the

70's and 80's many aircraft were tied outside. As of this writing, I am starting to see planes outside again due to hangar costs and limited availability.

Now regarding the dulling of the finish… our "wet look" coatings remain virtually identical to the first day the coatings were applied. Again, 10 years on our P-40 Flying Tiger and still looking good! Also, we once wiped decal adhesive off the P-40 with strong lacquer thinner right out in the sun at the Oshkosh Airshow without affecting the ***Clear Top Coating.*** On lookers were shocked and amazed as they watched this! The ***Clear Top Coating*** was unaffected and still shined brightly.

Also, this aircraft had never been waxed…

What quantity of materials will be needed for my plane?

This particular question is always a loaded one… any company that supplies covering materials knows that the best that they can do is to attempt at advising the material quantities. Each builder will use different amounts… some less than the general recommendations and some will use vast amounts above what is considered normal. One common mistake builders will make when using any process that is of a catalyzed mixture, is to mix up too large of a quantity. This is not the manufacturer's fault, just a learning curve on the builder's part.

Another item that we've found is that if a builder has plenty of extra chemical on hand, the tendency is to "pour it on" and end up with more coating applied… resulting in extra weight and money spent on the project. We've found that in our own covering projects, we always seem to be just slightly short of some chemical, while having a bit of something else left over. This is just the way it is. Just expect that you'll probably need an additional amount of something before finished. If the process was applied by robotics, we might be able to work it out to the letter, but we're just humans!

Our recommendations are based on the basic quantities we've noted over the years and also what other companies have said that our kit customers have required for their projects. Even though we're selling our own process, we are advising folks to order less chemicals instead of more… our goal is to help builders achieve a "wet looking" finish like our planes have… not to just sell chemicals to builders!

We've heard about builders using latex house paint for their finish. What do you think about this?

We have quite a bit of experience with this process. It was first tried probably 25 years ago on ultralights. Normally a coat of black latex was thinned down with water and brushed on bare fabric. The next coats were either rolled on like house paint or thinned down and sprayed on the surfaces. Normally, brush marks were visible even through the top color coats. The black pigment did block ultraviolet rays, but smooth spraying was always a problem. Sanding of the latex **was *like sanding rubber*** and of course, that is what it is! Also, the latex generally cracked as time went by. Any time the paint was damaged, the latex seemed to flake off … right down to the bare fabric.

We finally had to admit that after spending hundreds of hours building and thousands of dollars on our aircraft, we were **just *not going to gamble with latex house paint*** for a coating. The black was a good idea, but that's where it ends.

Popular paint for cars is a base coat/clear coat process. Does your system use this process?

Our process only utilizes a fully catalyzed color top coat and then is clear top coated for shine and durability.

What colors are available for Loehle Coatings?

Color samples are available with a standard selection of approximately 40 colors for fabric covered planes. The color choices are similar to the chips presently provided by other companies. Almost any color can be provided on request, including metallics, flats and even pearls.

Can the Loehle Coatings process be repaired?

Absolutely. Repairs are very easy. One simply trims up the damaged area, if it is on a fabric aircraft, scuff sands and simply uses ***Fabric Cement*** to attach a fabric patch. The patch is then treated just like if one was covering the whole surface… ***UV Blocking Primers and then Color Top Coats and Clear Top Coats…. easy.***

If a builder is repairing a metal or composite aircraft, scuff sanding and applying ***Filler /UV Blockers and then Color Top Coats and Clear Top Coats*** are all that is required. Repairs are, again, easy with our coatings.

Are your coating hazardous to work with?

The best method is to use a fresh air respirator when working with ***ANY*** chemicals. This not only applies to our chemicals, but to any other brand of covering systems that use vinyl urethanes and even "water-borne" ones. Automotive urethane paints also fall into this category. Many auto painters and aircraft restorers do not use the forced air respirators, even though they should. They choose to use only a good quality charcoal filtered mask (respirator). If the small paint particles and any fumes can get into your lungs, you need some type of respirator… even water-borne.

A complete system is relatively inexpensive for custom aircraft builders. The cost can easily be shared with another builder… but the bottom line is that they are now available for personal use. ***We feel you should consider these for any type paints… urethanes, vinyl-based liquids and even common oil based paints and water-borne paints!*** Most paints will give you a headache when you breathe them, so this should be a clue! We personally are concerned with fumes entering not only the lungs, but also the tissues of the eyes. It is a good idea to use a charcoal respirator with any chemicals one can smell.

We like to wear disposable jumpsuits that are fairly common in industry today. If you don't wish to use one, at least wear old clothes, shoes, hat, disposable latex gloves and maybe even goggles… along with a charcoal filtered mask (respirator).

Most chemicals used to cover aircraft are somewhat hazardous, but with a little caution and common sense, you'll be fine.

Can Loehle Coatings be used on certified aircraft?

As of this writing, they are not certified for use on certified fabric aircraft. We do have various customers that utilize our coatings when restoring fabric covered aircraft and love our system. Many love our system so much they just make log entries and send certain forms to the FAA. They often request for us to get STC's for our system. The plan is to have them certified in the future for fabric use, but right now, we're focusing on amateur built aircraft and all metal and composite aircraft. All our coatings can be utilized on certified metal aircraft under the present FAA guidelines.

If I'm building a replica and really don't want the high gloss feature of your system, can the finish be flattened?

Yes, the coatings can be made to not shine. A special ***Flat Clear Top Coating*** can be supplied on special request. However, keep in mind, the most popular warbirds at the large airshows like Oshkosh are finished in glossy paint today. If you want the **"WOW factor",** as one of our replica builders puts it, stay with the ***Loehle "wet look".***

Some aircraft paint systems on the market seem to not have a clear coat application on fabric. Why is this?

We can't actually speak for the various companies that offer paint systems, but our suspicions are that since most systems are already certified; they are bound by their government paperwork. The processes and chemicals they have certified could be as many as 50 years old! These figures come from published literature from the various companies.

Some companies offer clear coatings, but some also say ***not t***o use them over their other top coats!! The clear coats they provide are not really clear. They have a yellow looking tint to them that darkens somewhat as time goes on. Some representatives of various companies have told folks that our ***Clear Top Coatings*** will yellow in the future, but when shown our P-40 Flying Tiger aircraft up close, they had to admit that there was no yellowing… even after 10 years. Some companies are now using modern clear coats, so we must have done something right back in 1988 when we first starting clear coating our factory demo planes!

In summary, our coatings are the most modern chemicals available for builders today. Why would you want to use a process and chemicals that are nearly 50 years old?

Any other items we should know about?

Additional items to mention is that we are continuing to add information to our printed literature and items to our product list. If you don't see something you would like to order, please mention it to us and we'll consider adding it to our product list. Also questions you may have are welcome and may be added to this literature in the future.

If you plan to cover and/or paint an aircraft, we highly suggest that you consider our system before you choose a process. You will be glad you did!

Thank you for taking time to consider our system and allowing us to provide details on ***LOEHLE COATINGS.***

If you want the shiniest, wettest looking, most up-to-date system on the market today, with **LOEHLE *ULTRA-FLEX* TECHNOLOGY**, come see our process first hand.

~ PROCEDURE MANUAL ~

INTRODUCTION:

To start off, let us say that covering and painting is simple and fun. It is not black magic, so stop worrying about whether you'll be able to do it. Anyone who wants to cover and/or paint an aircraft can… they simply have to want to! It's that simple.

The purpose of this manual is to help builders in covering and/or painting their aircraft, as might be expected. The manual will include details for fabric covered aircraft and also composite and metal aircraft. Our chemicals are designed for use on all type aircraft.

Anyone that wants to cover and/or paint an aircraft can… it's not black magic!

We have had numerous requests over the last 40+ years of covering and painting aircraft for a manual on our methods and special chemical products. We have a few variations in methods that are somewhat easier to work with than some of the companies that are solely in the covering supply business. Our purpose is not to "dazzle" you with our "vast knowledge", but simply try and ease your mind that covering and/or painting is a piece of cake! ***And also to provide you with the most advanced chemicals on the market!***

Before we start discussing the actual covering and/or painting details, let's cover some general items, including some important warnings.

Our goal is to provide you with the most advanced chemicals on the market today!

CHEMICAL POINTERS:

You should wear an effective ***respirator*** when working with fabric cements, fillers and top coatings. A respirator is basically a mask that has charcoal type cartridges to filter out chemical fumes. You should use a ***fresh air respirator*** when working with any chemicals , if possible. A fresh air respirator is basically a respirator that has forced air delivered to a mask from a separate air blower unit.

The use of these two types of respirator systems not only applies to our chemicals, but to any other brand of covering and painting systems. ***The use of respirators is no joke… be smart and use them.*** It is best to have plenty of air ventilation also.

ALWAYS wear a respirator – period.

Fresh air respirator systems are available.
We feel you should consider these for any type paints… urethanes, vinyl based liquids and even

common oil based and water-borne paints! Most paints will give you a headache when you breathe them. We personally are concerned with fumes entering not only the lungs, but also the tissues of the eyes. Painting a room at home with latex (water-borne) can give you a headache.

Wear disposable jumpsuits when you are spraying any paints. If you don't wish to use one, at least wear old clothes, shoes, hat, disposable latex gloves and goggles.

Most chemicals used to cover and/or paint aircraft are somewhat hazardous, so use common sense when you're working with them.

WORK AREAS:

Garages or empty hangars are two fine areas to work in to cover and/or paint your aircraft. A basement is sometimes ok to cover the structures in fabric, but remember that fumes from the liquid chemicals will affect everyone in the house! We would never spray the chemicals in a basement.

For the spraying process, many builders build temporary spray booths out of wood or PVC plastic tubing and cover the booth in clear plastic sheeting. Exhaust fans are normally placed in one end, with disposable air filters in the other end to allow a good exchange of air to flow through the whole booth. It is very common for bugs to get into your paint project. Filters can be real handy to help control this problem.

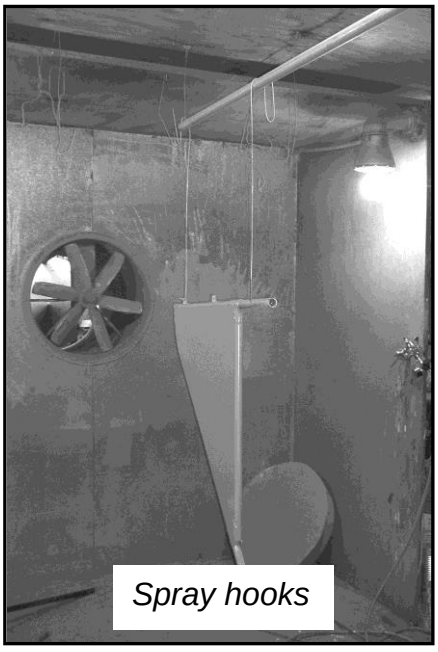
Good lighting is very essential in any area that you choose to paint your aircraft in.

Also remember that the fumes can be flammable. Have plenty of ventilation and set up fans to extract fumes from the work area. ***Never*** work with primers or color coats in a closed room, regardless of which company's products you are using!.

The temperature of your workshop should be in the mid-70's for ideal conditions, but many times those temperatures are not easily maintained. We supply thinners (reducers) that are designed for the various temperatures.

Saw horses are very handy when you cover and paint an aircraft. Some folks build fuselage and wing holding and rotating fixtures out of wood or tubing.

We use lengths of metal tubing (electrical conduit) that hang horizontal in our shop with common welding rod. This gives us places to hang our sprayed parts while they dry. We use welding rods to hang the parts from the horizontal tubing. Most parts have holes in them somewhere, so welding rods (wire) works well.



Spray hooks

The last tip on a place to cover and/or paint your plane is that it's best to be as dust free as possible. Vacuum up all the dust and dirt you can. Try to never sweep if you can keep from it… this stirs up a lot of airborne dust. Some painters even wet down the floor with water to hold down dust particles.

Now that we have the general warnings and tips covered, we can start discussing the actual covering and/or painting process. We will be discussing, in detail, the methods used for fabric covering of an aircraft initially. Composite and metal aircraft painting will be covered later in the manual and in a separate article that was featured in Kitplanes magazine on painting an RV-10.

PREPARING STRUCTURES FOR COVERING:

Any surface to be covered must be prepared for covering. Attention to detail is the key. Don't skimp on this important step.

WOODEN AIRFRAMES:

Structures should be as smooth as possible before covering.

The airframe structure should be made as smooth as possible ***before*** applying fabric. Wooden structures should be sanded smooth. Obvious low places or gaps should be filled to provide a smooth area to cover. Many fillers are available from common wood putties, "Bondo" or lightweight fillers. We like to use fillers that resist shrinking over time.
We finish sand our wooden structures where the fabric is attached with rather coarse sandpaper (100 grit). Some builders will want to sand it like fine furniture, but you will be brushing on several coats of fabric cement to these areas. Smooth transitions from one part to another and no "lumps" are the key to a smooth covering job.

Seal wooden structures completely before covering them with fabric… prevent those pin holes!

Wooden structures will also need to be sealed ***completely*** with liquid sealers before covering. We use a one-part polyurethane for all areas that must be sealed, but not where the fabric will touch the structure. We seal areas such as plywood leading edges or rib capstrips with thinned down fabric cement. This assures proper fabric adhesion and prevents any chemical reactions to the urethane fillers and top coatings that are applied later. **Two part epoxy sealers can also be used, as they are not affected by the fabric cements.**

The application of the fabric cement will completely seal the plywood and eliminate any pinholes in the fabric covering later. The pinholes are a result of insufficient filler in the fabric. If the plywood is not sealed now, it will pull the filler coating right out of the fabric like a sponge and leave pinholes in the fabric. (We also coat metal leading edges this way to prevent future pin holes.) Pin holes are really the #1 problem folks have when they cover their first aircraft. The pin holes first show up when you start painting. Our ***Wonder-Fil*** is used to fill any pinholes that do arise later.

We recommend that you brush on the sealer instead of spraying it. It is almost impossible to get 100% coverage when spraying wooden airframe structures. Generally, parts in front of other parts will block the sealer from reaching all the structure, if it is sprayed on. When brushing the sealer on, you can do a real good pre-cover inspection. Check every inch of the structure for any damage or missed glue joints as you apply sealer. You will feel that this may take too long, but you will have many hours in the assembly of the structure, so why not spend the time to seal the structure completely...

Rib capstrips should have three full strength coats of fabric cement on them. This is ***directly*** on bare wood. Unlike some aircraft covering companies, we cement the fabric to all the wing ribs. We feel this is better and provides a more secure covering job… whether you rib stitch or not… more on this later.

ALL rib caps MUST have three coats of cement.

As mentioned before, a two-part epoxy "sheathing" liquid can also be used to seal all wood structures instead of polyurethane or fabric cement, if you like. This is used on bare wood and is resistant to virtually all brands of covering chemicals. It is mixed before using (part A and B).

To restate:

- Seal all wooden structures with polyurethane type varnish. Do not use polyurethane varnish on areas where the fabric will be cemented. Again, a two part epoxy is great too.

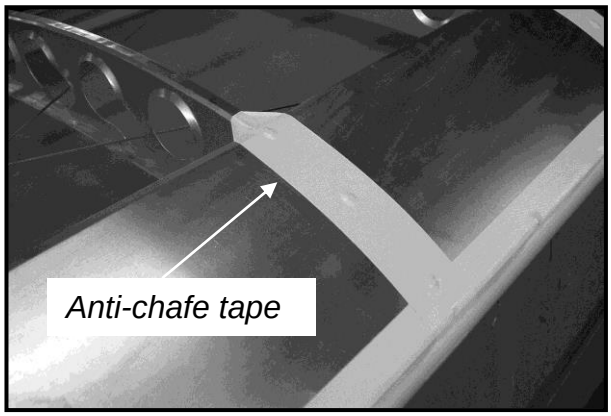
*- Plywood areas: 2 - 3 coats of thinned fabric cement on bare wood. This is **over** any two part epoxy sealers.*

*- Rib Caps: 3 full strength coats of fabric cement on bare wood. This is **over** any two part epoxy sealers.*

METAL AIRFRAMES:

To prep aluminum structures, clean thoroughly with Lacquer Thinner and Surface Cleaner and a rag. We use a good grade of painter type blue towels for this. Remember that thinners are especially flammable, so be careful. Remove all foreign matter such as sticky tape, glue, dirt grease and factory ink markings.

Check airframe for any damage before covering.



Check every inch of the structure for any damage before covering. Especially look for dents in tubular wing spars.

All gussets, rivets and bolt heads should be smoothed over using anti-chafing tape. This tape helps prevent the metal hardware from cutting the fabric now and in the future. The tape also works very well to smoothly transition the fabric over bracketing, etc.

We normally cut the tape neatly with scissors instead of tearing it off the roll. This produces a better-looking covering job, especially with lightweight (thin) fabrics used today.

Taping all the structural joints of a metal aircraft is time consuming, but well worth it in the end. We do this on all our cover jobs. Wooden aircraft seldom require the use of anti-chaffing tape, as the surfaces are normally sanded down to create a smooth transition from one part to another.

Tape all structural joints of metal airframes to smooth everything for covering.

FINAL PRE-COVER INSPECTION:

The first step is to assemble the aircraft with all control cables or linkages in place and adjusted. Make sure everything works smoothly. If shop space is at a premium, you can attach only the controls and cables that are required to assure that you can properly locate cable exit holes after covering. Obviously, rudder cable installation will not normally be required to check out aileron cables, etc.

PHOTOGRAPHING STRUCTURES:

We suggest you take many photos of everything at this point to help you remember all the details years from now. The FAA (USA government) also requests to see photos. We also suggest you get an experienced builder, A & P mechanic (that has kit building experience and likes them!) and/or an EAA DAR inspector to look over things before covering. Extra eyes are handy sometimes.

Note that we suggest that any major changes recommended by these folks be run by the kit manufacturer or designer. Even though the person may be very knowledgeable, they may not understand the whole design as it relates to their suggestion or "improvement"… enough said…

Builders located in countries other than the USA may want to check with other local builders regarding the pre-cover inspections required. The FAA in the USA no longer requires pre-cover inspections, as of this writing.

SAFETY HARDWARE:

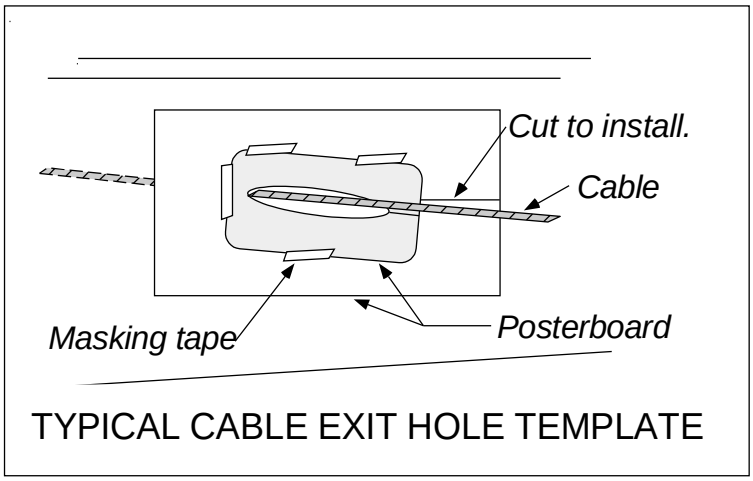
Safety all items that require you to do so (clevis pins, bolts, turnbuckles, etc.). This is the ***final check*** before the covering starts to hide everything.

CARDBOARD CABLE TEMPLATES:

We suggest that you take thin posterboard (cardboard) and locate exactly where control cables or linkages will exit the fabric covering. You can tape the posterboard in position and align with an obvious piece of structure that will be easily located after covering (such as a rib). Start by cutting out an oversize hole in the cardboard, tape it in place and have the cable pass through it. Work the controls from stop to stop and you will be able to notice if the cable exit hole location moves. Many times a slot will need to be opened to allow cable travel.

Remember to use posterboard templates to locate control cable/linkage exit holes.

Cut a small piece of posterboard with the approximate opening or slot that is required for cable movement. Tape it in place onto the larger posterboard. The more exact you do this, the closer you will be able to cut the exit holes in the finished fabric. The key to this is to be sure you can reposition the posterboard ***exactly*** in location after covering. Make notes ***on*** the templates to show exactly where to locate them later – do not rely on your memory as to the proper positioning. Taking pictures or video footage might be helpful also.



TYPICAL CABLE EXIT HOLE TEMPLATE

Disconnect the cables or linkages now. Safely store all hardware in marked containers so you can find it after covering. Secure cables inside the structure to be covered. We suggest that the cables be tied with string that can be "unknotted" easily or masking tape that will release readily. You will need to be able to reach inside the structure after covering with a wire, etc., and "fish" out the control cables. This is down through the exit holes located with the posterboard templates. Slots in the fabric can be burned with a soldering pencil before painting.

Safely store all hardware so you can find it after covering.

RIB LACING TEMPLATE:

It is advised that you make a pattern for rib lacing before you start covering the wing with fabric, if you plan to rib lace. This is discussed in the section on rib lacing further in this manual. Hole spacing for lacing can be done later, but it is easier before installing the fabric. Note that if you plan to rib lace using pop rivets PK screws or Martin clips, you should drill all the holes required ***before*** covering with fabric. Again, see the section on lacing further in this manual.

Pre-drill holes in ribs BEFORE covering.

FABRIC INSTALLATION:

Now, after the general overview is understood, we can get into the actual fabric installation. Methods of attaching fabric vary somewhat from each covering process manufacturer. We will describe our own method that we've been happy with for over 40 years. We feel our slight variations are a little easier than other methods.

APPLYING INTER-RIB BRACING TAPE:

Inter-rib bracing tape is sometimes installed in wings and runs from one wing rib to another in an "X" pattern. The purpose of the tape is to keep the wing ribs straight while covering. Most certified aircraft have this tape installed at their production factory. Kit type aircraft normally don't utilize this tape. Cemented fabric will actually hold the ribs straight, if you use your fingers to work them straight as needed after shrinking. One simply aligns the rib and then activates cement that is placed on the ribs before the fabric is installed. Some companies do not cement the

fabric to the ribs, so they need to install this inter-rib lacing tape. The cement is activated through the fabric with thinner or MEK.

COATING STRUCTURES WITH CEMENT:

In our process, we brush the entire perimeter of wooden or metal structures with a minimum of two coats of ***Loehle Fabric Cement***, letting each coat dry before adding the next.
We pour some fabric cement into a small can or plastic cup when we apply cement. The fabric cement is not mixed with any catalyst, so any unused cement can be returned to the larger storage can.

A 1/2" – 1" natural bristle type brush works well for applying fabric cement.

Coat the entire perimeter of wooden or metal structures with a minimum of two coats of fabric cement BEFORE laying on the fabric.

Cement dries quickly, so you can simply work your way around the structure and reapply when you get back to your initial starting point. This method is similar to the way early free-flight model airplanes are covered with tissue paper.

We use our cement full strength, unless it is leaving obvious heavy brush marks. We thin it with methyl ethyl ketone (***MEK***) or fabric cement thinner if it becomes too thick. Acetone also works to thin fabric cement. Thin the cement as required. Remember to wear a respirator while working with the chemicals. We wear ours, even while we apply cement. Most folks do not wear a respirator when they use aircraft fabric cement, but it's not a bad habit to get into. We also have air flowing through our work area to exhaust fumes.

An optional cementing method is to brush on the cement and immediately lay the fabric wrinkle-free into the cement. The wet cement is forced into the fabric with your fingers. Only 12" to 18" should be worked at a time because the cement dries fast.

We personally dislike this method because it is harder to keep wrinkles out and we like to ensure that more than one coat of cement is used to prevent starved glue joints (especially on wooden aircraft).

Coat rib capstrips with three full strength coats of cement.

After applying a minimum of two full strength coats of any fabric cement to the perimeter of either a wooden or metal structure, ***we coat rib capstrips with three full coats of cement***. As stated before we use the cement directly on bare wood on all rib caps. We coat plywood leading edges with two coats of thinned cement.

Basically, you want to have cement on all areas that require the fabric to be attached…the structure's perimeter and the top and bottom of rib caps.

You want to have cement on all areas where the fabric will be attached…

Note that we do run a 2" seam of fabric cement along the leading edge of wooden aircraft even though the leading edge is coated or sealed with thinned down cement to begin with. We like to rely only on this cement seam to secure the fabric here, even though the previously applied thinned coating would secure it well... we just like to be

sure at the leading edge. It is possible to thin cement and spray on large metal leading edges if you are worried about brush marks.

To review:

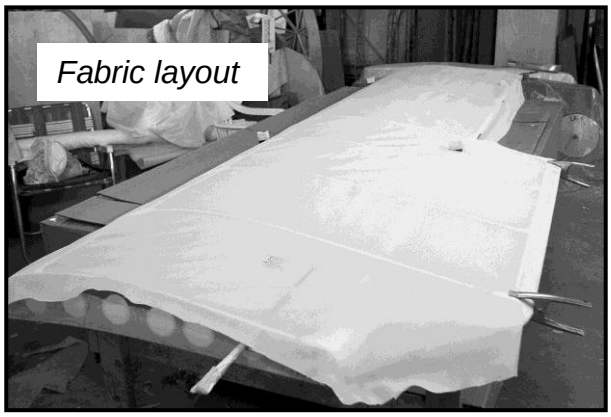
- *Brush cement on the entire perimeter of structure -*
- *(2 coats minimum).*
- *Brush 2" seams of cement along leading edges*
- *Brush 3 full coats of cement on the top and bottom of rib capstrips.*
- *The structure is now ready for the fabric.*

FABRIC LAYOUT:

We recommend that the beginner start with a tail piece, such as a rudder. If mistakes are made, recovering a small piece will cost you little in time or money. We like to cover the bottom side of the wings, horizontal stabilizers and elevators first, so the finished fabric seams are underneath.

Beginners should try their hand on a small structure first… such as a rudder.

If you're a novice to covering and/or painting an aircraft, we would highly recommend that you practice on one small structure, as stated. Taking the small structure ***all the way through*** the ***Clear Top Coat*** process ***before*** you work with additional structures can really be a benefit. This will not only allow you to become familiar with our unique products, it will also give you self confidence. If you have problems, you can see them and correct them before you repeat them on additional structures.


Fabric layout

Carefully roll out your fabric so you can cut a piece to length to fit the structure. We like to use ***lightweight*** spring clamps or a good grade of masking tape to position fabric panel in place exactly where we want it before we cut our fabric to length. We like to have a 2" minimum of fabric extending on all edges…slightly more if it's your first cover job.

One note on spring clamps and masking tapes. We say "lightweight" spring clamps to minimize harming the fabric. Sometimes strong clamps can slip and cut the new fabric.

Always use a good grade of masking tape… not the CHEAP stuff!!

We say always use a "good" grade of masking tape and not the thin, cheap stuff you buy at most department stores. Quality painters' tape is worth the extra

money to assure that ***no*** adhesive particles are left on the aircraft structure or fabric surface. The cheap tape will leave residue you may not even see until later. We refuse to cover or paint with ***ANY*** of the cheap tape. Cheap tape is banned in our shop!

The reason we like to position the fabric exactly in place is to help you ensure that your covering job will be as wrinkle free as possible ***before*** you start shrinking the fabric with your covering iron. (More on this later.) We feel that the smoother the fabric lays while you're gluing it, the less frustration you will have covering, especially for the novice builder. This is one of the primary reasons we dislike some companies' methods…you're lifting up the fabric and then laying it back down into the cement. We simply activate the two coats of cement with MEK right through the fabric! No lifting of the fabric and potential for causing wrinkles.

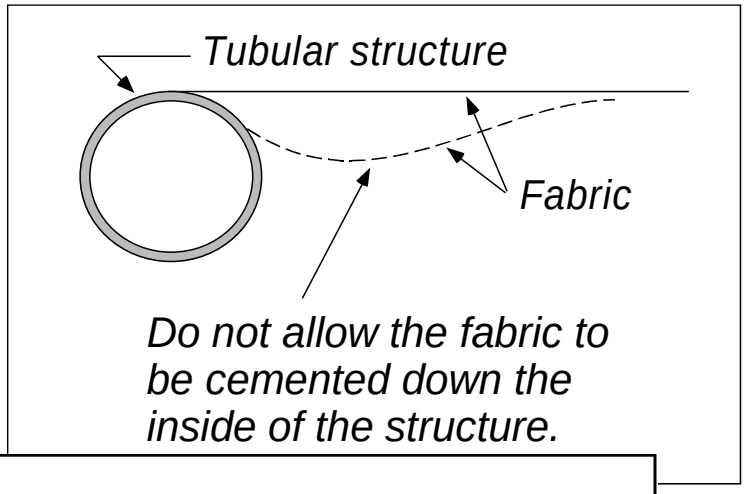
Please let us say that this discussion regarding each method may sound serious, but it's really trivial, as both methods work great. ***Don't lose sleep over this; just use the method you have the most confidence in for yourself.***

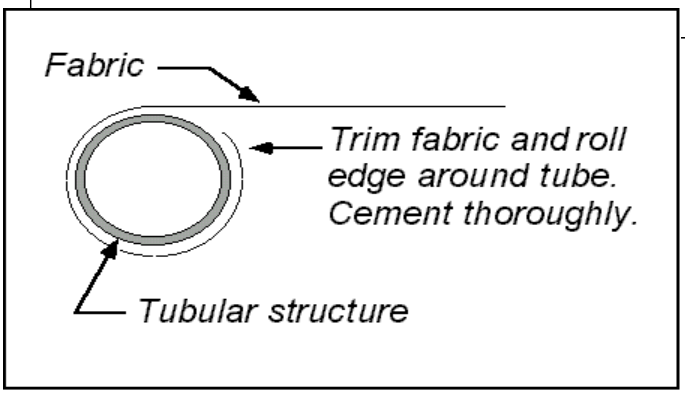
CEMENTING FABRIC:

Use a cement/MEK mixture to activate the previously applied cement... right through the fabric.

With the fabric neatly positioned, clamped or taped in place, start gluing the fabric along the perimeter. We work with a mixture of MEK or fabric cement thinner and cement to activate the pre-applied cement under the fabric. If everything dries too fast for you then add cement to the MEK. This will slow down the drying time. We use up to a 50% mixture as required.

Use your fingers to rub the fabric directly into the pre-applied cement as the MEK or cement thinner softens it. Do not cement any wrinkles in place. You should feel the cement rise all the way thru the fabric to the top. It is recommended that you wear "barrier cream" or rubber gloves to keep the cement off your hands. Work about 12" at a time. Be sure the fabric remains cemented down. The thinner method works so well and fast, you will have a tendency to move to the next section before the MEK has really dried.





You will find this method to work well. Do not cement the fabric down the inside of the structure, as it will cause noticeable uneven spots. The exception is when you are applying the first layer of fabric and a second layer will be joined to the first later.

Continue around the entire perimeter of the structure with this method of cementing.

After initial cementing, trim the fabric edges and cement them down completely. On tubular structures, roll the cut edge around the tube and inside the structure on the opposite side.

HEAT SHRINKING FABRIC:

A household iron is used to shrink aircraft covering.

Once the entire perimeter is ***completely cemented and dried***, you may then start heat shrinking the fabric with a household iron. The iron used is the same one used to iron clothes. The iron should be rated at 1100 watts minimum. A dry or steam iron can be used. Obviously, do not fill the steam type with water or allow it to produce steam.

A small hobby type (model airplane) iron is handy to iron trim tapes and patches. These irons are normally 165 watts. We have used these hobby irons to shrink an entire fabric job, only to learn later that the fabric was not shrunk as tight as it should have been. Bad news. Only use the larger irons to do the real shrinking of fabric in the flight load carrying areas. You will prevent wrinkles from showing up on your airplane on cold days by proper shrinking!

The covering will be shrunk in several stages with the iron temperature being raised as you go. We'll discuss this after we explain calibrating irons.

CALIBRATE IRONS:

In our early days, we did not calibrate our covering irons. Wrinkle free was our goal back then. The weight and speed of the designs have increased and make "proper tensioning" a requirement.

It's important to calibrate your iron…

To calibrate irons, use a candy thermometer or similar glass gauge type. Check the thermometer's accuracy by placing it in boiling water (212 degrees F at sea level) as a standard.

You will be marking the irons used at five temperature settings: 200, 225, 250, 300 and 350 degree positions. Make a stack of dry paper towels about 1/2" thick on your bench. Place the thermometer on the middle of the stack of towels with the iron on top. Some folks say to use a heat sink compound on the thermometer here. It's probably a good idea.

Raise the iron's heat control lever up and watch the thermometer rise. Be sure to give the iron time to readjust in temperature after you change settings. Mark the iron at that specific temperature. Repeat this for all the settings.

Use the same extension cord each time you use the iron.

Some irons will raise and lower temperatures dramatically above and below the setting you want. Plus or minus 10 degrees is best, but plus or minus 15 degrees will be fine to work with. We like to mark the iron at the five different temperatures using a permanent fine line marker, so it will not be wiped off easily.

Another note - use the same extension cord each time you use the iron. Mark the extension cord with masking tape, etc., and label it for use with your iron. Calibrate your iron with this

extension cord in place. Just for reference, you might try other cords and calibrate again to see if it matters on your iron.

Each project you cover should start by calibrating your iron again. We don't do this for each structure we cover, only every two or three months between uses. Also, recheck if someone drops your iron. If your shop is like most, "no one will have dropped the iron", but a chunk of plastic mysteriously becomes missing off the iron! If the plastic is not broken, someone may still have dropped it and "forgot" to mention it, so recheck it yourself to be sure.

Remove any silicone heat sink compound ***completely*** from your iron, if you have used it. Silicone does not mix well with paint and will create terrible "fisheyes" (craters) in your paint!

Calibrate your iron at:

200, 225, 250, 300 and 350 degrees

Regarding temperature settings: 200 degrees is used to soften any cement ridges or drips. This saves you from sanding them out later. You can also iron out any fabric wrinkles or folds from bare fabric without shrinking it too much.

Slight trailing edge "scalloping" is normal… especially on light structures.

225 degrees is good for smoothing finishing tape edges and patches.

250 degrees is used as the first step in shrinking fabric and removing wrinkles.

300 degrees is the second temperature range to tension fabric. We like to shrink to the 300 degree range and check for any obvious twisting or warping of structures. Ultralight or lightplane structures sometimes will not take the full 350 degree temperatures. It is common for trailing edges to "scallop" slightly with virtually any covering process. This is simply "aircraft" and we find it ok. It's tough to create a thin part that is lightweight and tapers to a thin trailing edge shape that will withstand the shrinking of the fabric completely.

Use caution at the 350 degree setting…

350 degrees is used for final shrinking whenever possible. Above 350 degrees, the fabric will normally become permanently loosened again! Around 375 degrees the polyester filaments start to lose all measurable tension. At 415 degrees, they start to melt. This makes for unhappy builders!

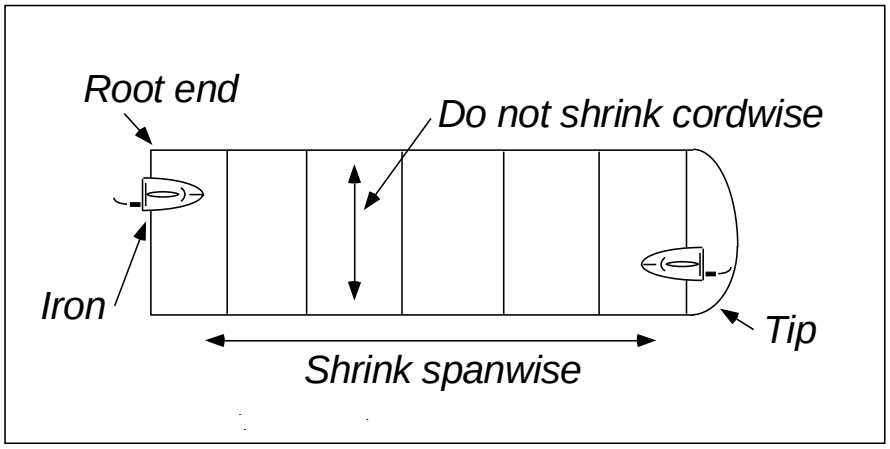
SHRINK FIRST SIDE AT 250 DEGREES:

To start shrinking of the fabric, begin with the 250 degree setting. Be certain all the adhesive seams are ***good and dry*****.** After the cement is totally dry, shrink the fabric.

Shrink all you can at the wing tip and root areas, before working between the wing ribs.

You will be ***amazed*** at how the fabric will shrink up and remove wrinkles. On wings, we always shrink at the wing tip first and then at the wing root. This draws the fabric spanwise and helps keep the fabric from

bowing down between the ribs. The object is to have the entire wing the same airfoil shape. This is really impossible to accomplish, but theoretically this is our goal.



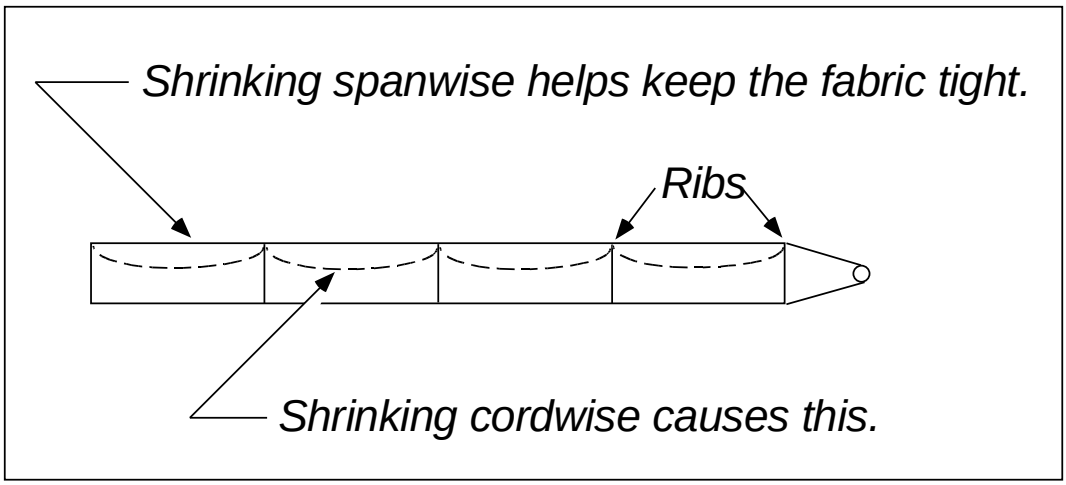
Shrink the entire surface at 250 degrees. Temperature is what shrinks the fabric, not the amount of time the iron is held in one place.

Try not to use settings above 250 degrees on seams that are cemented. This will soften the cement and makes the seams pull loose. Temperatures above 250 degrees are left for the shrinking of fabric away from seams.

We like to cover one side of a structure and use our hobby iron to smooth out any wrinkles at the cemented areas. Do not iron or glue any ribs or stringers at this time. We want the fabric to slip (draw tight) over these.

Don't iron or cement ribs and stringers yet.

Ironing at 200 to 225 degrees will smooth out even brush marks left when applying cement. We like to run the iron over every cemented seam this way. You will see that it makes everything really smooth and any lumps of cement will even flow out.



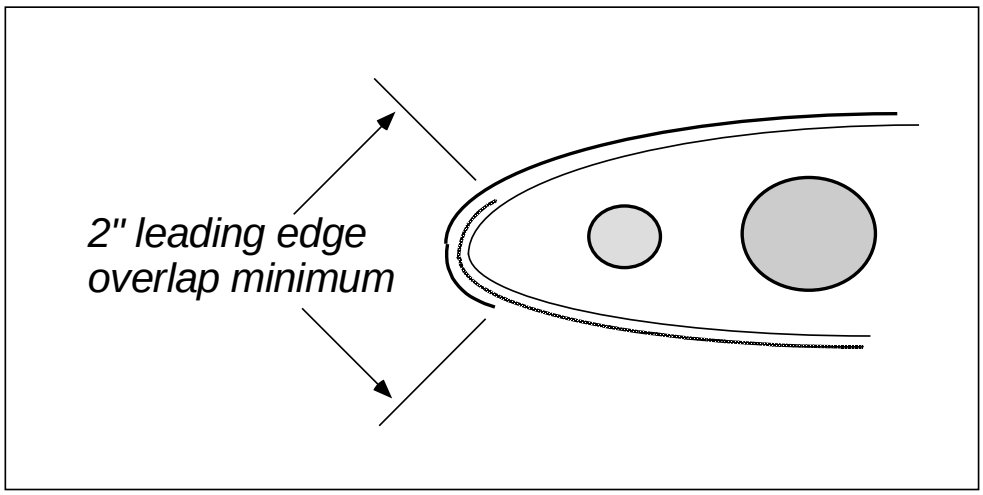
We do not shrink the first side past the 250 degree setting until the other side is also covered.

ADD ADDITIONAL CEMENT ON THE PERIMETER SEAMS:

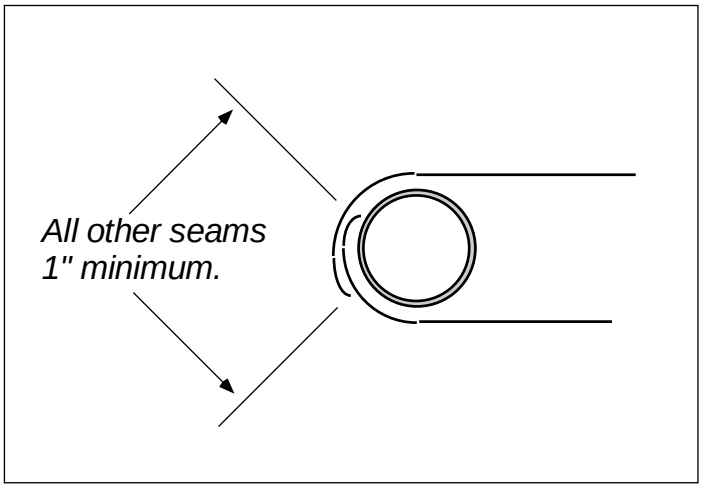
After ironing the perimeter seams, coat the areas where other fabric will lap onto the seams you just smoothed out with your iron. Use two full strength coats of cement for this, just as you did for attaching the fabric directly to the structure. Allow these coats of cement to dry thoroughly before adding the next layer of fabric.

INSTALLING FABRIC ON THE SECOND SIDE:

You will now be able to see why we like to iron out the glue seams before cementing the second piece of fabric in place…you would be covering a wrinkled area with fabric!



Once the cement is dry, position the fabric in place with clamps and masking tape as you did for the first piece. A minimum of 1" overlap is required for any lapped seam. A 2" lapped seam is the minimum for a seam on the leading edges of wings. You may want to use a common chalk line to mark straight lines along the wing leading and trailing edges for good alignment of your seams.



Cut the fabric to length.

Once all is positioned and nearly wrinkle-free, glue it in place as you did the first pieces, 12" or so at a time.

SHRINK SECOND SIDE AT 250 DEGREES:

Once the cement is thoroughly dry, shrink this side of the fabric at 250 degrees. All the previously mentioned steps can be followed for fuselages, wings and tail pieces… all are covered very similarly.

SHRINK FABRIC AT 300 DEGREES:

Once both sides of the structure have been shrunk to 250 degrees, increase the temperature to 300 degrees. Shrink as you did before…wing tips and root areas first on wings. Shrink the entire fabric surface at 300 degrees. ***Remember not to iron cement seams*** and to ***watch for lightweight structures deforming. Try not to iron directly on top of the ribs***, as we want the wrinkles to slide away as they need to. If you iron directly onto the ribs, you will activate the cement on the ribs and prevent the fabric from being shrunk spanwise. Remember, the idea is to shrink the fabric from one edge to the other, especially spanwise.

Any wrinkles that may be next to cemented seams can be removed by using short bursts of heat to these areas. Remember to not allow the iron to stay on a seam at 300 degrees, as the cement will let go.

SHRINK FABRIC AT 350 DEGREES – USE CAUTION:

If you are happy that you are not seeing too much structure deformation, go up to a 350 degree setting on the iron. This will be the final shrinking. We use the 350 degree setting ***only*** if that particular structure if rigid enough. Trailing edges of most wings are the weak link. Use your best judgement on this. And, no, we don't think a builder should "strengthen" a trailing edge and add excess weight to the aircraft.

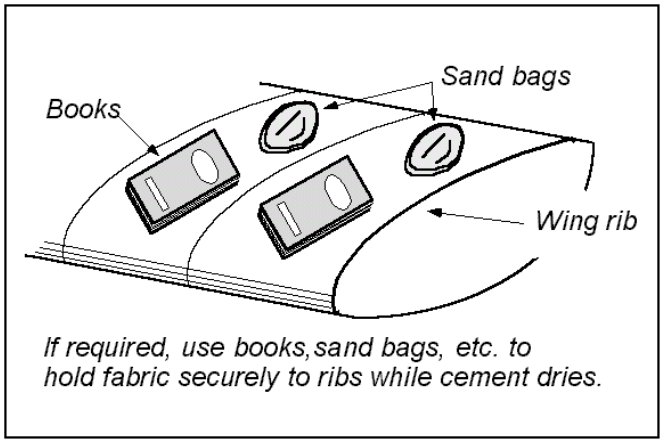
CEMENTING RIB CAPSTRIPS:

ALL ribs should be cemented.

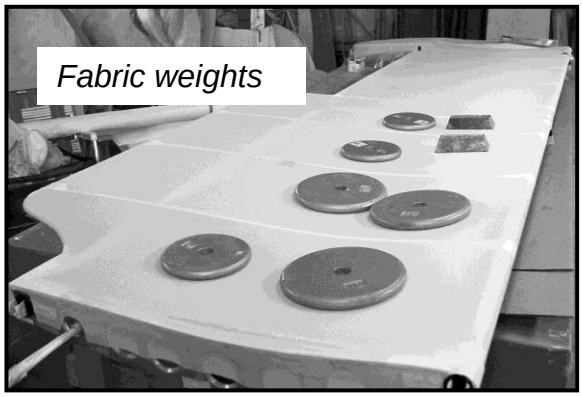
Next, we like to cement the fabric to the ribs. We feel that ***the fabric should be glued to the ribs.*** We make no exceptions on this, even if you elect to rib stitch your wings. We like to have ***every inch of fabric cemented to the ribs*** and then have the rib stitching as a bonus.

Take time when cementing the rib capstrips. You need to work small sections at a time. You may need to use weighed objects on both sides of the capstrips to help hold the fabric down while the cement dries. Hardback textbooks, sand bags, etc., can be used. No sharp objects though…you don't want to cut the fabric.

Remember to cement ***both*** sides (top and bottom) of the ribs on wings and tail pieces…



If required, use books, sand bags, etc. to hold fabric securely to ribs while cement dries.


Fabric weights

WASHING OF FABRIC:

Before applying the first coat of ***UV Blocking Primer***, it is recommended that you wash the wing fabric with ***Surface Cleaner***, ***Universal Urethane Thinner or MEK*** after the final shrinking. This will remove what they call "sizing". Sizing is used in the manufacturing process of the fabric. ***MEK*** is very flammable, so use great caution when washing fabric this way. Be careful and do not allow the thinner to release the fabric along the rib capstrips.

Never use industrial shop rags or laundered rags… many times they're treated with silicones, etc.

Use clean cotton rags to wash the entire surface. ***Never*** use industrial shop rags or laundered rags. They are many times treated with silicones, etc., to help remove dirt and grime the next

time they are laundered. Fresh painters' rags or 100% cotton cloth from a fabric store are good. Common paper towels are terrible, as they leave small "dust type" particles.

Be sure to allow the fabric to dry thoroughly before applying the first coat of ***UV Blocking Primer.***

Always blow the surface off with compressed air and use a tack rag over the fabric before you apply the ***UV Blocking Primer.*** The fabric surfaces can and do create static electricity that sucks dust onto them. We know of one paint shop that even attaches a grounding cable before and during spraying. We don't have any idea if it works…

Always use a tack rag!

RIB STITCHING (LACING) AND FINISHING TAPES:

The next step is to apply rib stitching and finishing tapes. The rib capstrips should have already been cemented.

We generally did not rib stitch any of our wooden aircraft we manufactured previously. The speeds of 100 mph VNE don't require it. The wood provides excellent bonding of the fabric, if you follow proper methods. We have never seen any fabric pull loose from a rib on our low-speed aircraft, if proper cementing practices were followed. If you elect to not ribstitch, you ***MUST*** have previously applied three full coats of cement on the bare wooden rib capstrips before the fabric was installed. If you applied fabric and ***didn't*** apply enough cement, you ***must*** rib stitch.

Please note that the method of using cement only to secure the fabric to the ribs on wooden aircraft flying under 100 mph is an experimental method.

If you elect to use this method, you do so at your own risk. Our previous aircraft company and many others have utilized this method for years, but it is still the builder's decision to not rib stitch. We hope we are clear on this! If you have ***ANY*** reservations, simply rib stitch…

All metal wing ribbed aircraft must be rib stitched, in our opinion. We will not fly an aircraft with conventional covering over metal ribs without it. Several methods of mechanically fastening of the fabric to the metal ribs are available. We'll discuss each and explain our favorite.

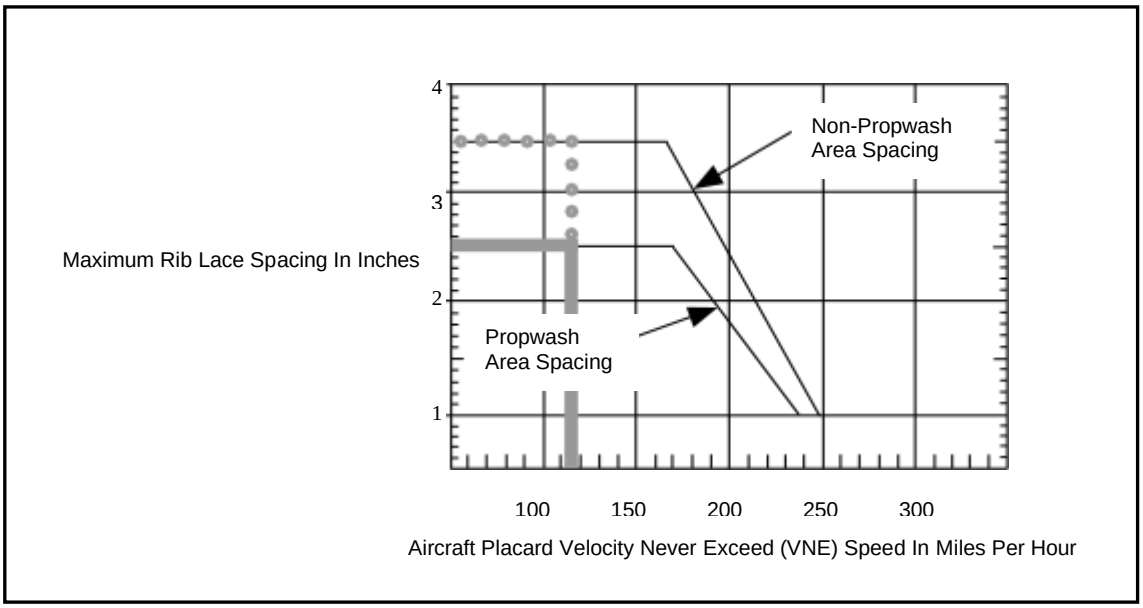
Concerning rib stitching…. The oldest method is using cord and "lacing" the fabric to the ribs. It is sometimes called lacing because you generally lace around the whole rib and not just stitch it to the top or bottom rib caps.

Many chapters can and have been written over the years on rib stitching.

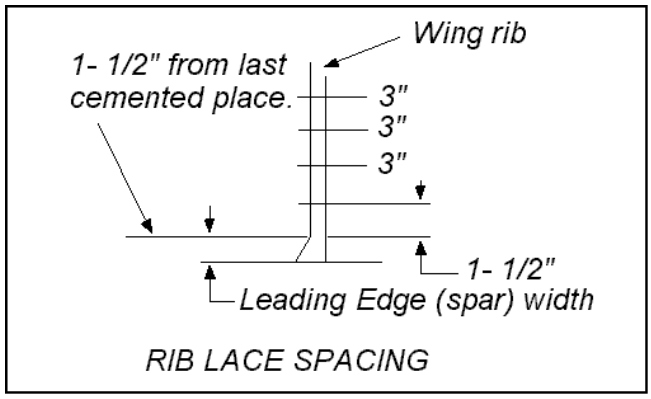
RIB STITCH HOLE SPACING:

The government has established a chart for rib stitching. The spacing chart needs to be followed, if the aircraft is certified. If the certified aircraft is being recovered, one needs to follow the exact spacing used on that aircraft. The spacing could vary from the government chart. Consult the mechanic/inspector that would return the aircraft back to service after covering. ***As of this writing, our process is for experimental aircraft only.*** We do plan to certify in the future.

When using the chart, please note that the spacing varies as to whether it is in the propwash area or not. When using the chart as a guide, we would simply space them all at the propwash spacing. This makes all the measuring simple and the lacing is nice and straight when you view them while looking down the wing.



For experimental aircraft 100 mph and under, the spacing we use is essentially 3" between each stitch. We start the stitching by laying out the locations along the ribs. Most lightplane ribs are high lift and will be flat or under cambered on the bottom side. This will require two separate spacings to keep the stitching straight up and down. Remember that the upper surface is curved greatly and is longer in length than the bottom side.

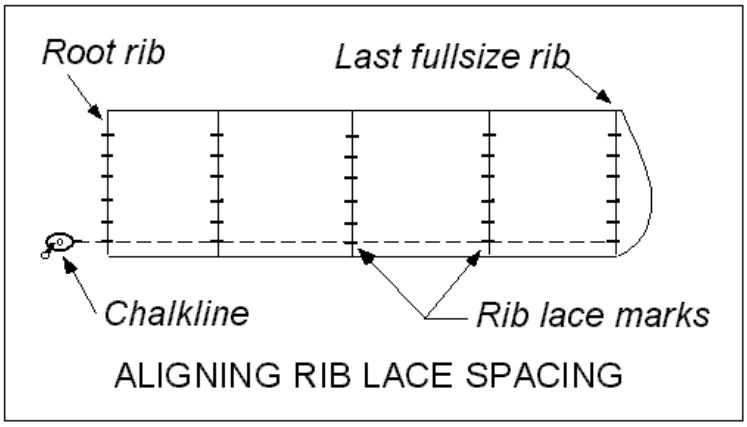


Start with the root (inboard) rib for your layout. Use only a pencil to do your layout. Magic markers and ink pens sometimes bleed through painted areas! Always start your spacing one half the space you will use for the spacing on the entire rib. We like to space 3" apart, so your first mark will be 1/2 of 3" (or 1-1/2") from the last cemented place on the leading edge. This is where your wing rib intersects the cemented leading edge…usually at 90 degrees from each other. Mark this location.

Next, measure aft along the rib at 3" intervals and mark these locations. On low speed aircraft, we place the last mark with roughly 3" left to the trailing edge and this is satisfactory. Work accurately and you will produce a very neat rib lacing job.

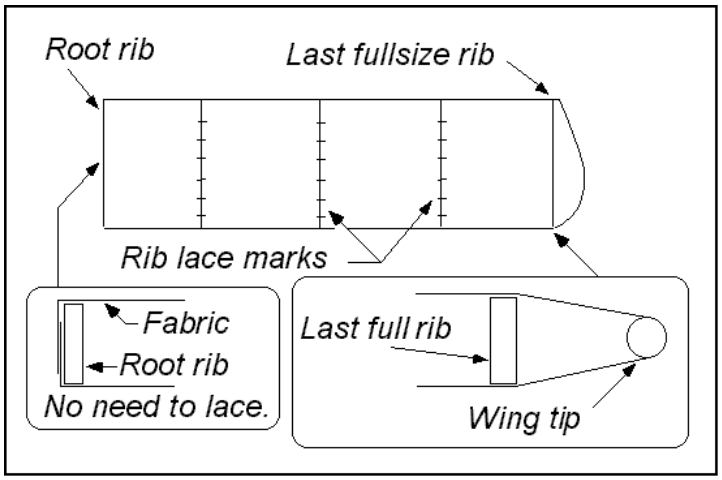
Now move to the wing tip area and repeat this for the last "full" rib. Sometimes wing tips will taper or change shape, so use the last full rib. Measure this exactly as you did the root rib.

Repeat this step for the rib that is halfway between the root and tip ribs.



Use a common chalk line to locate the other lacing hole locations on the remaining ribs. Snap the chalk line as accurately as possible. You will have some beautifully spaced stitching holes.

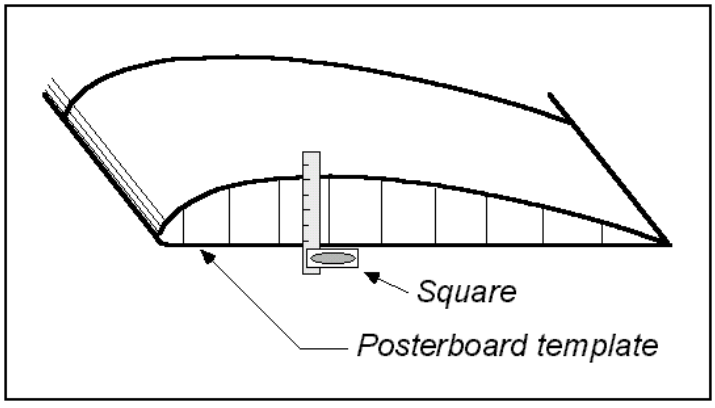
Note that we do not rib stitch or rivet the root or last full rib typically…the exception is if the tip rib is far away from the actual wing tip bow. The fabric will normally pull down tightly, because of the tip. The root rib has the fabric cemented down the side of the rib…no need to stitch or rivet here.



Now you need to go back to the root rib and make a cardboard (posterboard) template for the location of the bottom side stitching holes.

This is very easily done by cutting out the basic airfoil shape and placing it next to the root rib. Transfer the top side marks to the template.

Transfer the upper marks down to the rib bottom using a small square. Align the square along the rib bottom. This will keep the stitching cord as straight (up and down) as possible.



If the rib is under cambered or somewhat curved on the bottom side, use your best "eyeball" to arrive at straight stitching alignment. The template is now used to mark the stitching hole locations along the bottom side of the wing…obviously with the bottom side up for working convenience. Remember that your reference point (leading edge) is now on the opposite side after flipping the wing!

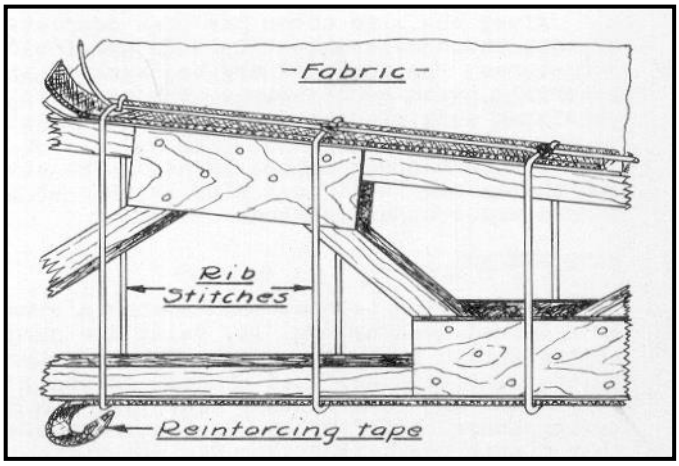
Mark the hole locations and snap your chalk line as before.

Note that this method works on wings that have parallel leading and trailing edges. Some wings are tapered. These are somewhat unusual, but several of our aircraft designs have tapered wings. We presently don't rib lace these designs, but the simplest method is to start from the front of the leading edge structure and work toward the rear. This will have the spacing locations basically

run parallel to the leading edge. The wider portions of the wing (root) will then have more stitching holes than the tip areas. These holes will be added to the rear portion of the wing.

It's good to try and think about any structural members that could interfere with your rib stitching hole locations (such as a wing box spar). A floodlight can be used to shine through the wing to help reveal internal structure. You may move the hole locations if required. This is seldom required.

REINFORCING TAPE:



After the hole spacing is located for all ribs, we will add reinforcing tape along the ribs. Reinforcing tape is an adhesive-backed tape that is stuck to the fabric over the rib cap ***before*** rib stitching. It is on the outside of the fabric. This tape helps prevent rib stitching, screws, clips or pop rivets from cutting the fabric.

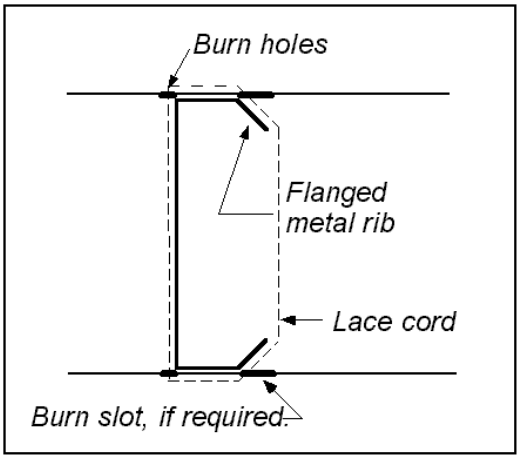
Use reinforcing tape that matches the width of your wing rib, if possible. 3/8" and 1/2" widths are standard.

We like to extend reinforcing tape 1-1/2" or so past the last stitching hole location on both ends of the rib. Some builders run the tape on out to the edge of the wing to prevent having a tape cutting edge showing. Cloth finishing tapes will be placed over the whole works later…

Cut the tape edges neatly so they look neat and aligned.

PUNCHING OR BURNING RIB STITCHING HOLES:

After the tapes are in place, punch stitching holes through the fabric with a rib stitch needle or the tip of a soldering pencil. We like to use a soldering pencil because it melts the edges of the hole together. Be careful as you can easily burn unwanted holes in the covering, if you are careless.



If the wing rib has an angled flange on one side of the rib, you will need to elongate the hole on the flange side to allow the stitching cord not to pucker the fabric when drawn tight. Keep in mind that finishing tape will cover all the holes.

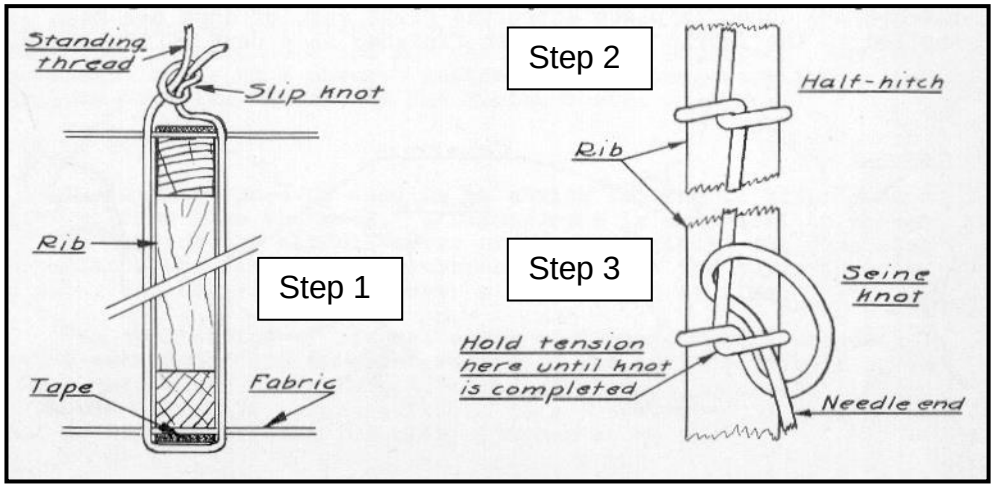
Pre-punch all the required holes in the top and bottom of the wing surface. Work as neatly and carefully as possible.

Rib stitching or lacing has been done for years. Many various knots have been used and they vary almost as much as airplane designs! The whole process looks complicated, but it's really not. We have found that virtually all the knots work well… some are a little more confusing to tie than others.

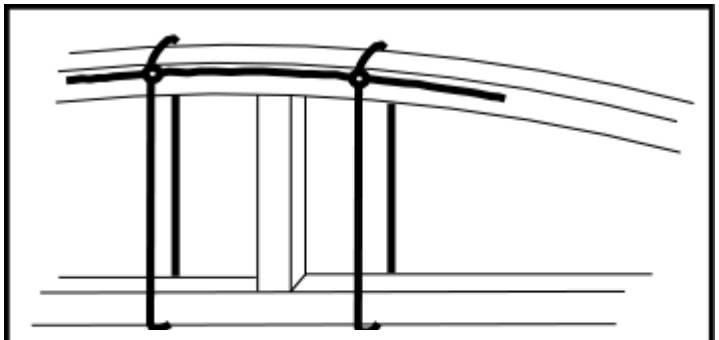
Two types of stitching cords are common. They are either round or flat. If you use flat cord, work the cord so that it lays flat across the top and bottom of the rib.

The most common knot used in rib stitching is a seine knot.

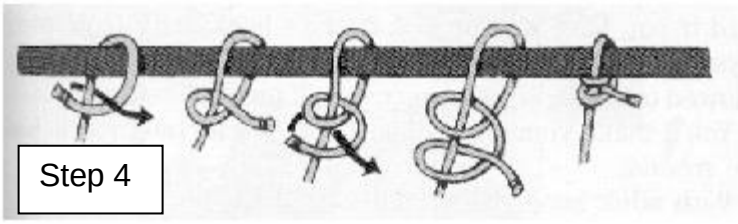
On metal aircraft, we prefer to use wide flanged pop rivets instead of rib stitching cord as mentioned previously. We don't rib stitch any of our under-100 mph wooden designs, but if we wanted to rib stitch one, we think that rib stitching with a cord and needle is the best way to go.



Starter Knot *Common Seine Knot*



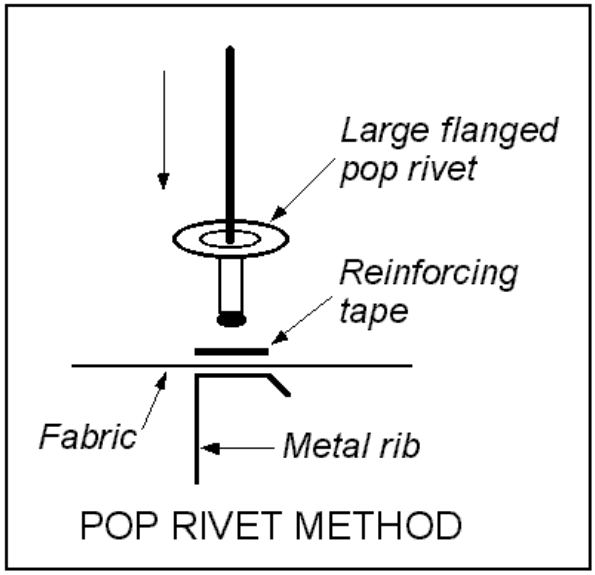
Use curved point needle to run the Cord UNDER fabric from hole to hole.



Finish up with a common Half Hitch knot and Tuck the clipped end inside the fabric.

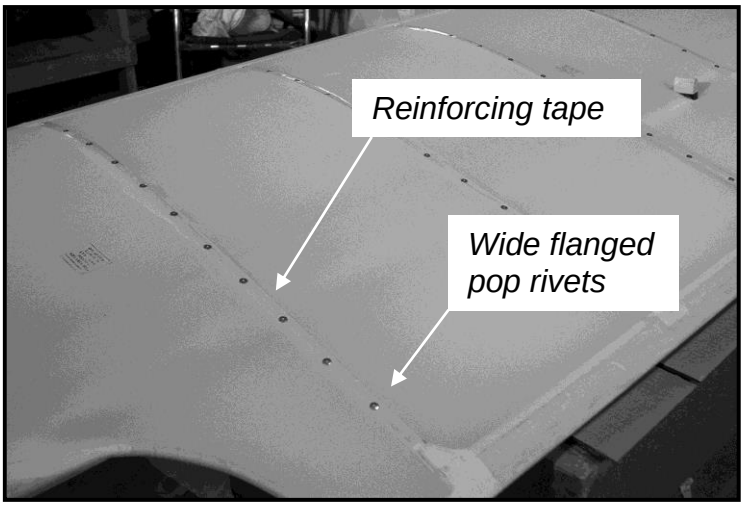
POP RIVET METHOD:

The pop rivet method we like uses special wide flanged aluminum rivets. We use the same spacing as we would for the rib lacing method using cord. The top to bottom alignment is obviously not as critical with this method.



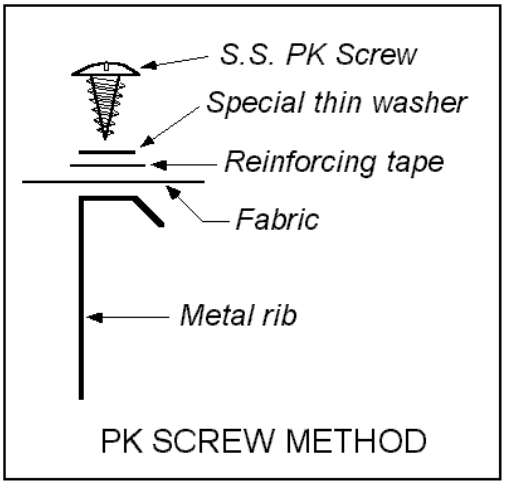
With this method, however, we like to pre-drill and deburr all the rivet holes in wing ribs ***before*** we cover. This helps keep metal chips from being left in the wing and wearing holes in the fabric as the years go by. Place reinforcing tape on top of the rib as mentioned in the previous discussion.

You can use a soldering iron to burn the holes into the fabric and reinforcing tape after the wing is covered, similar to the rib cord lacing method. Finishing tape will be applied over the rivets later.



PK SCREW METHOD:

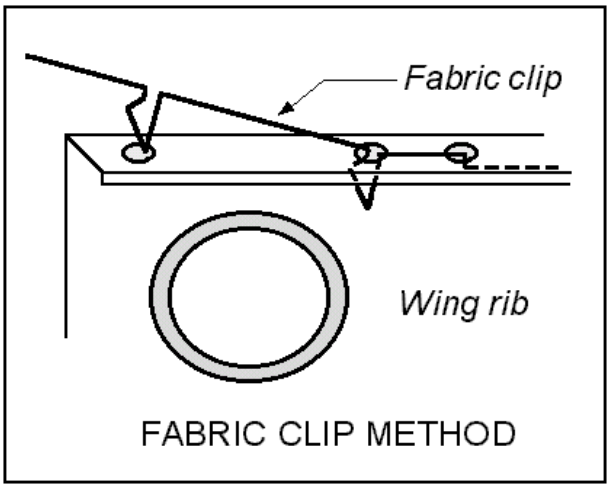
A third method of attaching the fabric to the ribs mechanically is with PK screws. PK screws are small, self-tapping aircraft sheet metal screws. We would prefer to use stainless steel screws, if we chose this method. Lay out the same spacing as before and we would still pre-drill the ribs before the wing is covered. Remember to drill the holes undersize to allow the screws to hold. ***Never*** install screws without pre-drilling the holes…this could damage the rib structure.



If using screws, you should use a thin (.016 aluminum) washer under the screw head to keep from twisting the reinforcing tape as the screw is tightened. We don't like the added height of the washer under the screw, so we use the pop rivets…real trivial point though.

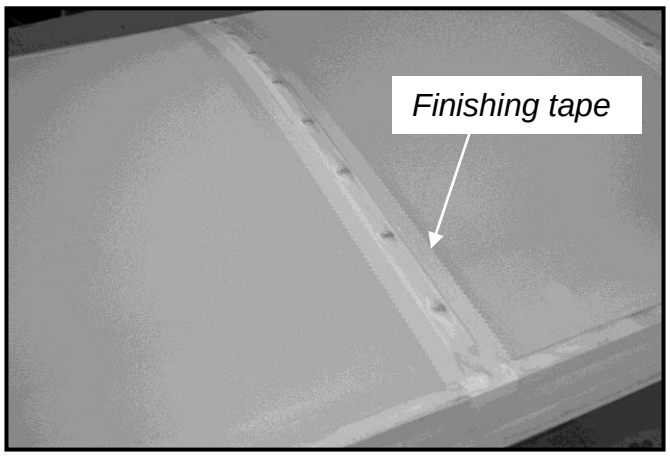
FABRIC CLIP METHOD:

The last common mechanical rib fastener for metal ribs are fabric clips. They are pre-formed wide clips that run from one end of a rib to another and have wide barbs that push down through drilled holes. We don't use them because you can't alter the hole spacing, if required. If used, pre-drill the ribs ***exactly*** to fit the fabric clip spacing and use reinforcing tape as before. We suggest you experiment first before settling on this method and drilling all your wing ribs.



FINISHNG TAPES:

After rib stitching, wipe off any cord wax or oil from mechanical fasteners with some thinner and a clean cloth. The wax off the stitching cords can ball up around the holes.



You will need to fill the reinforcing tape with thinned cement before proceeding. Use a narrow brush and apply two coats of cement to the tapes.

Finishing tapes are pretty easy to apply, if you work neatly and keep them straight. If you just "glue 'em on any old way", they will look terrible!

Finishing tapes are basically pre-cut strips of fabric. Some companies have pinked

edge tapes, yet others have straight. Many opinions are out there about which are best, but they both work great. We like straight tapes, as I know they are much easier to apply and finish than "pinked" edge tapes, but ***worry about something else instead of this subject!***

Two types of tapes are available for modern polyester type fabrics. ***Straight tapes*** are used most of all for straight lines. This "straight" tape means that the weave is along the length of tape and we're not talking about the tape edges, as previously discussed. They can be curved somewhat as required while installing.

The second tape is called ***bias tape***. These are cut at a 45 degree angle as compared to the fabric weave. This special cutting allows the fabric to go around curves beautifully without any real effort. They do get a little narrower as you go around a tight curve.

Bias tapes normally have aggravating sewn seams every three to five feet. We cut the tape at the seams, as we don't like the sewn areas. We also do not use pre-sewn envelopes in order to not have to deal with the sewn seam and the inside fabric flaps. Some builders love them, but we don't. Again, ***worry about something else!***

Bias tapes are pricey and should be used only around curved areas.

We mostly use 2" wide finishing tapes. 4" tapes are good for wing leading edges. We don't use any 1" tapes, but many folks do, especially if they elect to install tapes over all their stringers.

We differ with some in that we like to keep the covering as simple as possible and as lightweight as we can. We don't use tape on ***every*** rib capstrip, longeron and stringer, as some builders do. Sometimes you see so many pieces of tape on stringers that overlap each other and actually create heavy 3 to 4 ounce fabric when the builder finishes! We like to tape leading edges and the perimeter of wings and tail pieces. We also tape all fabric seams. Since we normally don't rib stitch our wooden aircraft, we skip using tapes over all rib caps and stringers. We simply don't see the need in all the work and money for aircraft under 100 mph VNE.

Be sure that all wrinkles, bubbles or lumps of cement are smooth before applying additional cement and tapes. You will save yourself a great deal of future work, if you smooth out blemishes as you go. To apply tapes, use a 2" brush. Pre-coat the area carefully with a coat of fabric cement. Thin the cement only if you are getting brush marks when the cement dries.

If you aren't sure you can brush the cement in a nice straight line, then draw layout lines with a pencil and a straight edge. This will also help in aligning the tapes as you put them down. We don't fool with lines, but you will have a neater covering job if you do.

After the first coat of cement dries, add another (second) coat of cement. Thin the cement, as required. The secret to having the finishing tapes secured well is this second cement coat. If there is not enough cement, you will have many "pinholes" show up later on when you add the ***UV Blocking Primer.*** Pinholes are really frustrating and are easily avoidable by using enough cement.

We cut the tapes to exact length before cementing them down.

Your cement should be thinned 50% with cement thinner or MEK. We brush the thinned cement where one end of the tape strip will lay. A couple of inches of cement is all you want to apply. Rub the tape into the cement and let it dry well.

Once the "tacked end" is dry, we pull the opposite end snug. Then we brush thinned cement directly along the finishing tape. We work from the tacked end to the opposite end. Work the tape down well with the brush and/or your fingers. The tape will stick nicely. Try to remove any air bubbles immediately before the liquid dries. Air bubbles around screws, pop rivets, or rib stitching are normal. Don't sweat these. These bubbles are actually transitioning the tape from the top of an item down to the flat of the fabric, somewhat like a fairing. This is good. Don't try to remove these little "air fairings"…they are actually helping you. Just make sure they are saturated with the cement.

Allow the tape to dry well (30 minutes or so), and then re-coat the tape with thinned cement again. Work quickly and don't keep brushing when the liquid starts to tack up. It will leave brush marks, as we discussed before. This coating of cement is also thinned 50% and will virtually eliminate pinholes in your tapes. This is the key to preventing pinholes. We can't state this more plainly! Learn before moving to more finishing tapes, then your life will be easier and you can help others later!

All straight tapes are applied with this same procedure. A chalk line is handy to align leading edge tapes. Any tapes applied over seams should attempt to cover the seamed edge with one-half the tape. A 4" tape should be used on the wing leading edge.

Bias tapes work similar to straight tapes. Mark a pencil line along the middle of the tape. This line will help you keep the tape centered as you stretch the tape around curved areas.

Tack the starting end and allow it to dry thoroughly before proceeding. We like to pull the bias tape around the curve and secure the other end in place with masking tape. Be sure it's taped well. If you stretch the bias tape properly, it should lay flat along both sides of the curved structure. Remember to keep the bias tape centered. We then brush on cement to secure the bias tape. Remove the masking tape and finish cementing. Builders have long-winded methods for applying tapes, but it not "rocket science", as they say.

Using the tip of your iron can smooth the edges of tapes out. ***Never*** exceed 225 degrees temperature, as your tapes will shrink. This will ruin your day! We like to "iron" our tapes lightly before applying the extra liquid coat to the top of the tapes. It works well to melt everything together. It is real important to make sure that the tapes are ironed smooth. If you try to iron much on top of a liquid buildup, the iron will leave marks worse than brush marks! If you take time to ***completely finish each and every tape*** as you go, you will have a professional covering job. If you rush through putting on tapes, it will show up later in the final paint! Go slowly and treat each tape as the only one you have to do!

Be careful, as we warned before, and do not allow your iron to shrink the tapes. Test some tape scraps to prevent this.

Tapes are somewhat time consuming, but you will find them worth the added effort. The added cost and time is really minor compared to the entire building process.

INSPECTION HOLES:

Inspection holes are used to access specific areas on an airframe once it is covered. Aileron pulleys are just one example. We always try to locate them on the bottom side of structures, if possible.

You may want to make a list of where you want to place access holes before you cover.

Use actual fabric cement to secure the plastic rings directly to the fabric. Wipe off any cement drips, etc., with ***MEK*** or fabric cement thinner.

Staple a piece of fabric to a wooden frame (kind of like a large picture frame). Pre-shrink the fabric at 250 degrees. This will remove any wrinkles or folds from the patches. Never apply a patch that has a fold in it to a covering job. Pre-shrink the wrinkle out first. It will be nearly impossible to properly remove the wrinkle later…trust us on this…everything will shrink out of shape!

A thinned down coat of cement brushed on the entire piece of fabric while it is still on the frame will make the patch application work extra well. This is optional, but we like to do this as it helps prevent those dreaded pinholes!

Cut out a circular fabric patch about the size of a gallon paint can. Use pinking shears, if you are using pinked surface tapes.

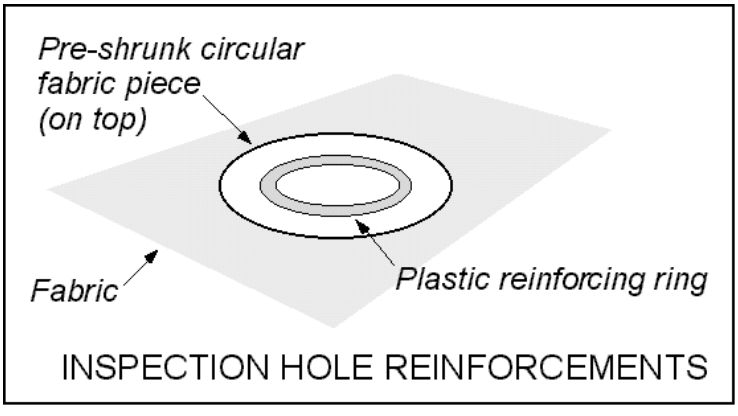
Mark the exact location where the inspection ring will be placed and trace it's location onto the fabric with a pencil. Also trace the outer edge of the circular fabric patch location. Be sure that you have removed any wrinkles or lumps of glue.

Apply a coat of cement to the area you marked.

Once the cement is dry, add a second coat of cement just like you do for surface tapes.

Once the second coat is dry, apply cement to the backside (flat side) of a plastic ring. Place it onto the fabric at the exact location you marked previously.

Apply the pre-shrunk fabric patches over the cemented plastic rings using cement and brush, as you did for finishing tapes. We like to "iron out' patches after they dry ***completely*** and before adding the brushed-on top coat. Spend the time now to remove any blemishes and ***totally finish the inspection ring areas*** individually… just as you did for the tapes previously.



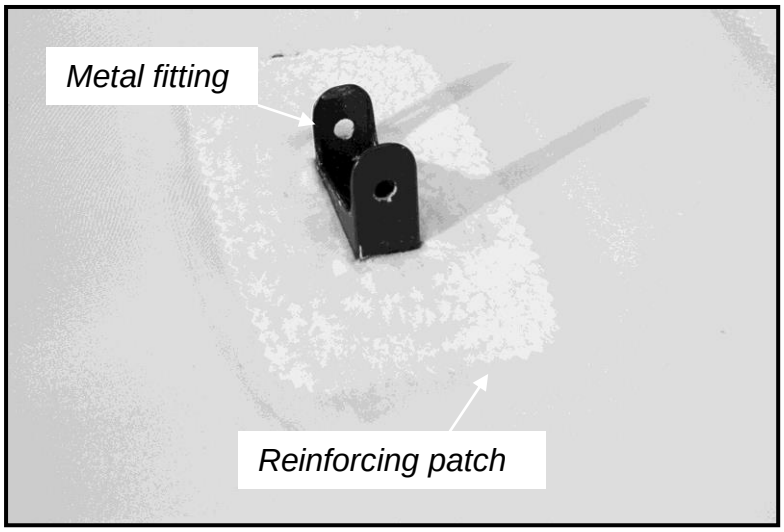
INSPECTION HOLE REINFORCEMENTS

Don't cut out the fabric inside the plastic rings until after painting, or simply wait until you need to get into that particular location.

Don't forget to paint your metal inspection covers as you paint your aircraft.

REINFORCING PATCHES:

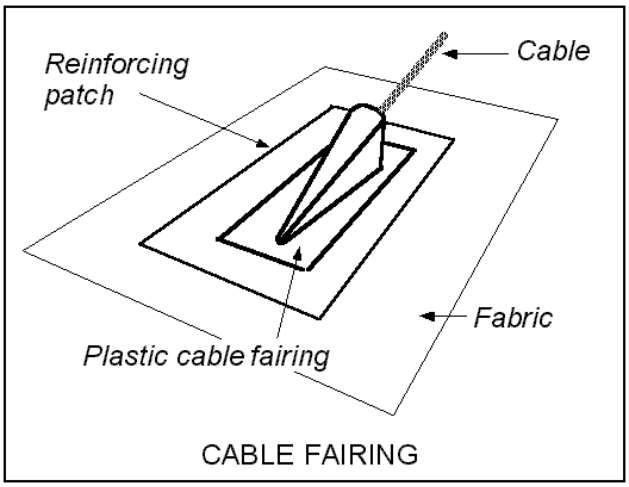
Reinforcing patches that go around fittings, brackets, etc., also use pre-shrunk fabric similar to the inspection hole patches. We go ahead and apply a coat of thinned cement to the fabric while it's stretched in the frame. Once the liquid dries, simply cut the reinforcing patch to shape and use liquid to apply it (similar to finishing tapes). Iron out the patch and then brush on a top coat of thinned cement.



CABLE FAIRINGS:

Cable fairings should be added before the addition of ***UV Blocking Primer***. Use your cable exit hole templates made before covering to locate where fairings go.

Cement the fairing in place with fabric cement. Once secure, apply a fabric reinforcing patch around the entire fairing where it lays on the fabric. Remember to remove any blemishes before you apply the top coat of thinned cement. Also note that they offer some very nice injection molded fairings available for this purpose.



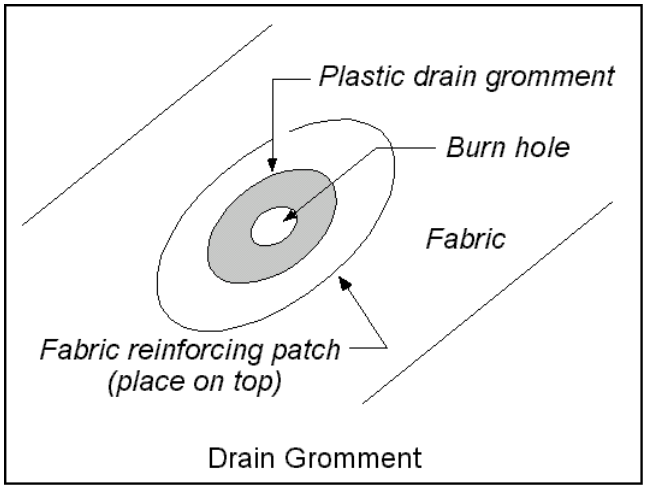
CABLE FAIRING

DRAIN GROMMETS:

Drain grommets need to be applied to the aircraft at low points where you think water or moisture would collect.

The holes need to be thought out well for placement.

They should be about 1/4" in diameter. You can burn them in place with a soldering pencil. You can simply burn a hole into the fabric and not use any reinforcing grommet, but you must have two layers of fabric (i.e. fabric or finishing tape). Plastic grommets are best though.



Drain Gromment

We cement grommets in place and make a little 2” diameter circle patch over the top of them. Brush on liquid as you did for surface tapes and inspection rings. Remember to remove any blemishes before you apply the top coat of cement. Some folks only glue these on, but they can pop off years later and look terrible. Use 2" cover patches!

Burn the 1/4” holes ***after*** the drain grommets are completely installed and dry.

HEAT SMOOTHING ENTIRE SURFACE

This next step is one that will help provide you with a professional looking covering job. The goal of this step is to iron smooth all the tapes and patches that have been applied prior to applying the first coat of ***UV Blocking Primer***. You have been instructed to iron all of these items already in the previous steps, but now is the last time to remove any blemishes easily. It will become a little harder after the next step.

Remember that you should not use your irons set to temperatures higher than 225 degrees for this step. You can be using both your large and small irons for this step. The tip of the small iron seems to work best.

Any lumps of cement need to be smoothed out with your iron. By using heat and a little pressure, the lumps will magically disappear. A wet cloth with MEK or fabric cement thinner will also thin down a run or drip of cement very well. You can then pass the iron over the area after the thinner evaporates.

You will have some cement buildup as you use the irons for these steps. Clean the iron, as required.

All wrinkles that you might find need to be removed now. If you can’t seem to remove the wrinkle, apply some MEK to soften the area up. Let the MEK evaporate before you apply too much heat.

All tapes should now have the edges stuck down well. Pinked style tapes are notorious for having the points pop up… this is why we prefer straight tapes.

Remove any bubbles that may also be in any of the tapes. Go over all the tapes and you will have a fine covering job.

Recheck the entire structure before proceeding. You can use your hand to feel for anything that is rough. If you feel sharp edges, “sand them smooth” with your iron.

Tape up any fittings and items that you do not wish to paint at this time with masking tape and/or paper.

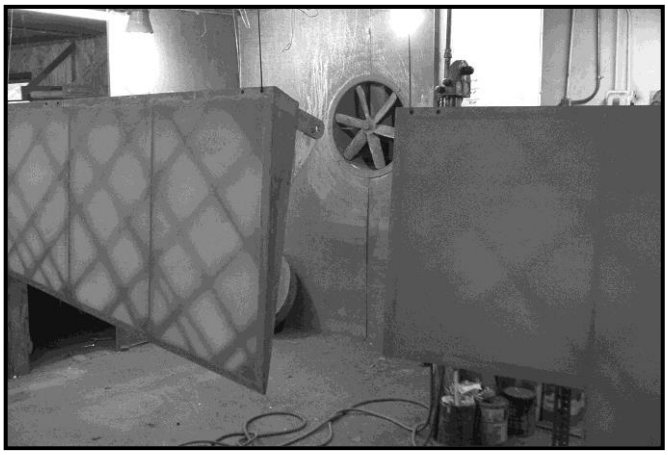
APPLY FIRST COAT OF FILLER COAT/UV BLOCKER:

Now apply the first coat of ***UV Blocking Primer***. To us, this is probably the most important coat you apply. This coating, in our opinion, needs to be brushed on to provide the proper amount of liquid to completely seal the entire fabric area. We’re not convinced you can force the liquid in

all the spots by spraying and not have dry or starved areas. The purpose of this first coat is to "wet" every square inch of the fabric thoroughly and attempt to eliminate any pin holes.

*Our first coat of **Black UV Blocking Primer** is on the right… and on the left, is another brand of chemicals on their first coat. It's rather obvious which one is providing immediate UV protection by blocking light rays!*

*Just wait until you see the UV blockage with the first sprayed coating of our **Black UV Blocking Primer**.*



Use a good quality natural bristle brush. Natural bristle throw-away brushes would be great, if the bristles wouldn't fall out into your covering job! Don't use 'em or you'll pay the price of trying to remove bristles and messing up the finish. High quality polyester brushes are ok, but we like a painters' grade 3" natural bristle brush for applying the thinned down ***UV Blocking Primer***.

Next, we will discuss our whole chemical process again before starting, as a refresher…

As stated previously, our system utilizes the most advanced chemical technology currently available and features **LOEHLE *ULTRA-FLEX* TECHNOLOGY**. Our system is based on modern urethane chemicals and produce the ultimate in very high gloss "wet looking" finishes. Note that our special formula ***does not require*** the addition of any flex additive or so common with many other companies products. The exception to this is for our ***Color Top Coatings***.

Our ***UV Blocking Primer*** system features unique chemicals that we provide in either black or white. The chemicals are the same, but have either black or white pigment added to them.

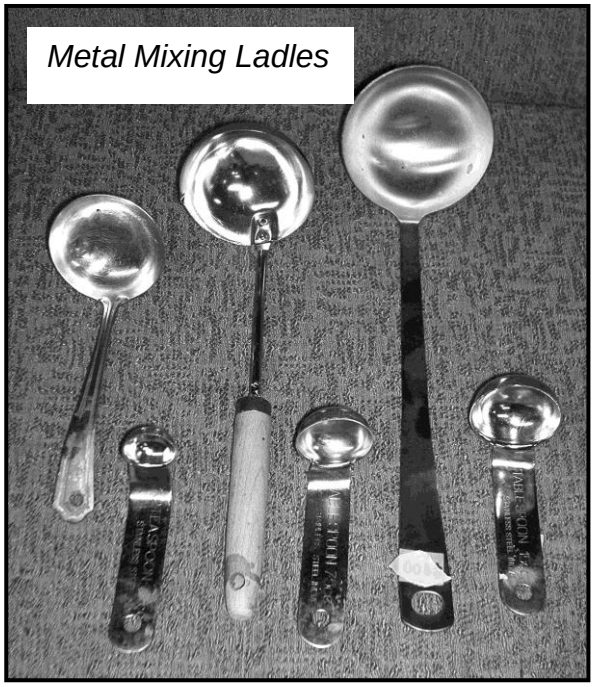
The ***Black UV Blocking Primer*** is first thinned down and brushed on the bare white fabric. When one first starts applying the special black chemical, ***the real magic starts to appear***… the black color over the white fabric is immediate and dramatic. ***There is no question about where you have applied the chemical and what has not yet been covered!!***

The ***Black UV Blocking Primer*** are very high in solids (thick) and must be thinned a great deal to allow them to be applied with a brush, yet not leave brush marks.

Always mix the ***UV Blocking Primers*** well before you work with them. They are very heavy with solids and can settle out rapidly. We recommend that you use a commercial style paint shaker to thoroughly mix the contents before you use the ***UV Blocking Primers*** the first time. They can be borrowed readily by taking your cans of ***UV Blocking Primers*** into a local paint store and asking them for their service. They'll be glad to help.

Don't forget to use proper safety gear… fresh air respirator system, gloves, jumpsuit, etc. We carry these items for your convenience and encourage you to take our cautions seriously.

Numerous methods are used by builders to measure out amounts of chemicals. Auto body shops use graduated plastic measuring cups. The problem we have with the various methods is that they are normally for rather large quantities of liquid… a quart or more at a time.


Metal Mixing Ladles

Many times when we mix chemicals, the quantities are rather small. We may mix as little as 2 – 3 ounces for various touch up projects and large mixing cups will not work, unless you are willing to mix extra and ***expensive*** chemicals. Once multi-part chemicals are mixed, you cannot save them. This is just the nature of any modern, high quality chemicals.

We have used various metal ladles (spoons) for years and are somewhat surprised that other folks have not picked up on this method. Their use is the most accurate way that we know to mix smaller batches of multi-part chemicals.

You may dip a ***CLEAN*** ladle directly into your ***UV Blocking Primer***, as you count the 4 parts of the chemical. Pour the ***UV Blocking Primer*** directly into a mixing cup. Again, remember to mix the storage can thoroughly before starting.

The ***UV Blocking Primer Catalyst*** should be poured directly into the ladle while holding it over the container with the pre-measured 4 parts of ***UV Blocking Primer*** in it. **NEVER** allow any ***UV Blocking Primer Catalyst*** to enter your storage can of unmixed ***UV Blocking Primer*** or you will have one expensive can of unusable urethane!

Hold your ladle again over the mixing can while you count out the ***Thinner*** parts. Mix the contents thoroughly. Work carefully, as it will be thin and ***splatter easily***.

Always clean your metal ladle well when finished. We keep a small cup of lacquer thinner to dip our ladles into to wash off the chemicals. Wipe them clean with paper towels.

Thin the ***Black UV Blocking Primer*** for this step with ***Universal Urethane Thinner***. You can choose one of six thinners that are specially formulated for various temperatures. We use ***Accelerated Thinner*** in this mixture, as it works well and doesn't sit long enough to soften any fabric cement. This is not even a problem if you just mix with standard ***Universal Urethane Thinner***. Just don't over wet cement areas that might soften…no biggie.

The mixing ratio for the first brushed on coat is **4:1:30**. This is simply 4 parts of the ***Black UV Blocking Primer***, 1 part ***UV Blocking Primer Catalyst*** and 30 parts of ***Universal Urethane Thinner***. And yes, we did say 30 parts of thinner! Use only 15 parts thinner for heavier fabric. The goal is to thin it enough to encapsulate the fabric weave, but not so thin as to leave pinholes. You may test and vary the amount of thinner you utilize.

We told you that the ***UV Blocking Primer*** was **VERY** thick!
**** Remember to mix the storage can contents well before measuring out the chemicals.***

FIRST BRUSHED COAT MIXING RATIO:

4 parts Black UV Blocking Primer

1 part UV Blocking Primer Catalyst

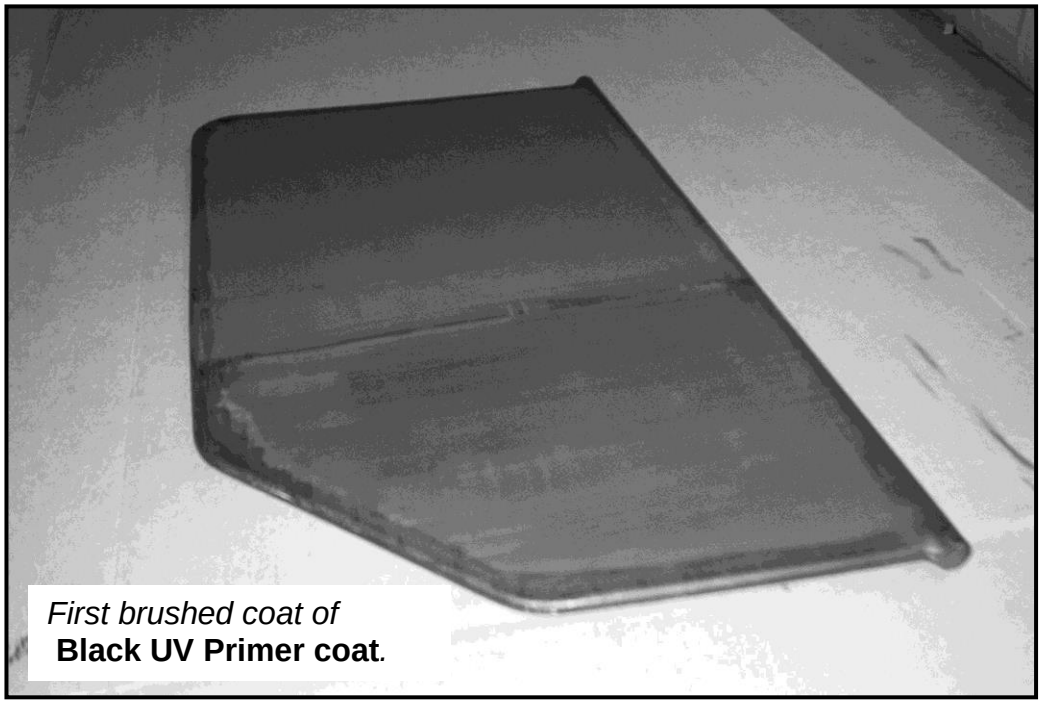
30 parts Universal Thinner (or 15 parts)

Allow the mixed chemicals to react (catalyze) with each other for approximately 5 minutes, before applying. Stir this mixture again and often while you are applying them with the brush. The pigment can settle out quickly. We use clean plastic mixing cups in our shop.

You should blow off the entire surface to be coated with compressed air and tack the surface with a tack rag. A tack rag is a special rag normally made of cheese cloth and coated with a sticky substance that will allow any dust to stick instantly. Be sure to use proper moisture traps anytime you use compressed air to prevent water coming through your air lines onto your project.

When you first start mixing the ***Black UV Blocking Primer*** for brushing, mix very little of it… try 1/2 teaspoon of the ***Black UV Blocking Primer*** with ***Catalyst*** **BEFORE** you add the thinner. You will find that this mixture will go a long way… much further than you would ever expect.

Remember to wear a respirator while working with the chemicals. We wear ours, even while we mix up the chemicals. We also try to have air flowing through our work area to exhaust fumes. Gloves are a good idea too.



First brushed coat of **Black UV Primer coat**.

The structure you will be coating should be laid flat if possible, to take advantage of gravity and help eliminate brush marks. The large quantities of thinner will allow the chemical to flow out

well. If you have brush marks that are not gone after the thinner dries, you could add additional thinner.

You will need to wet the fabric well to fill the weave. Areas over leading edges and structural areas soak all the way through and provide an extra bonding of the fabric to the structure. You will immediately see the advantage of our unique ***"black on white"*** process. You will know ***exactly*** what has been covered!

Work neatly and try not to allow drips to go everywhere. The mixture is rather thin, but you will get used to it quickly. The mixture must be thin to completely soak into the fabric weave. This basically "encapsulates" the entire structure with a thin urethane coating.

Brush the liquid on and quickly remove any air bubbles that may form with the brush. Do not play around very long with your brush, because the chemical will "tack up" quickly and leave marks.

If you're putting on enough liquid, you'll likely see runs on the inside of the fabric. This is perfectly ok and will not hurt your fabric job. Just remember to make sure they stay on the inside of the structure. You may have to rotate the structure you are coating to take advantage of gravity. A wing, for example, will have the excess liquid build on the inside of the wing panel as you coat the top side.

Watch to make sure that any runs inside the structure aren't so heavy that they drip to the bottom layer of fabric. You would then know you're applying too much liquid. The black color will again be very obvious on the white fabric.

If you have drips going to the next layer of fabric, wipe them with a thinner soaked painters towel to remove as much liquid as possible.

Once you have coated one side of a structure and it dries, you can flip it over and coat the opposite side. If you get runs that drip to the bottom (previously coated side) of the fabric, it will not be a problem as it is already sealed. The drips will not show.

Don't forget to blow off the entire surface to be coated and tack the surface with your tack rag, as before.

The structure is now completely coated with the thin layer of urethane and it should be ready to apply the first spray coating. You will notice that it will sound much different. Now, if you thump it, it sounds like a drum!

If you see obvious areas that are sticking up, you can address they at this time. Most items can be carefully ironed down with the tip of your small iron. If the blemish will not stay down, you don't have cement between the two pieces of fabric. It is OK to use a small paintbrush to apply a little cement to the area and rework it down smoothly. The next spray coating will cover it well, once it's glued down. Little areas are common with your first covering jobs. Don't worry too much, just work them out… you will get better the more you cover.

APPLY FIRST SPRAY COAT OF BLACK UV BLOCKING PRIMER:

This next step will require the use of spray equipment. Many chapters have been written about spray painting. Equipment can and does vary from each manufacturer.

Some folks like to use older style siphon feed spray guns that utilize compressed air from a compressor and water trap. The more modern HVLP (high volume, low pressure) spray systems that use less air. Some of these work off air compressors and others have their own turbines that provided the needed air. The HVLP systems use less pressure, thus more of the paint spray will stay on the item you're painting and not become over spray. We use HVLP spray guns with top feed siphon cups.

The choice of which one to use will be totally up to you or your painter. Our chemicals are all designed to be used with all systems.

Recommended spray pressures for the two types are as follows:

Spray at 25 – 45 psi for HVLP guns
Spray at 45 – 60 psi for siphon feed guns

Vary air pressure as you need to for your system. Remember that air pressure is measured with the gun trigger pulled and not at rest. Also, more air pressure helps to atomize and "bust up" paint and makes the drops smaller, with less orange peel look. A little overspray is actually ok…

The following is information gleaned over many years of using spray equipment. We hope it will be helpful to you.

Questions regarding spray guns come up on a regular basis and we will attempt to explain what we have learned… especially about the modern HVLP (high volume low pressure) type guns.

The older standard paint guns that were used for years were siphon feed guns with the paint cups below the air trigger. These guns used a lot of air to mix with the paint to properly atomize the particles. This was necessary to have the paint particles "busted up" or thin enough to flow out evenly on the surface being painted. This resulted in a lot of paint being sprayed into the air (overspray), which the EPA (government) didn't like. They mandated that the paint be reformulated with much less thinner used and thus HVLP type guns were created.

The modern HVLP guns will spray paint that is much thicker, with theoretically much less air. This results in more paint being directly applied to the surface and less overspray… which pleases the government. The problem is that even with HVLP guns, the paint droplets that come from the gun are normally bigger and create craters like "orange peel" on the surface being painted when first applied … especially by novice painters. It is also quite common to see some orange peel on brand new factory automobiles because of these thicker type coatings. It is somewhat the "nature of the beast" as they say. Also, vehicles that look 100% smooth probably had the final clear coat "cut and buffed" to remove any texture or over spray. Our ***Clear Top Coat*** chemical is formulated to be buffed out to remove any blemishes and dirt particles.

Our chemicals have specially formulated thinners that will allow the paint to flow out (drop to drop) before the paint sets up. This is accomplished with thinners that are designed for various temperature ranges. This makes our paint products EPA compliant, as a minimum of thinner is used. Thinner evaporates into the atmosphere and makes the EPA upset…

Most of the printed literature that novice painters receive with any of their paint guns will have recommended air pressures to use for their guns.

We measure air pressure with a regulator at the compressor or at the incoming end of the gun. Some literature will give settings for this type of measurement, but are really only recommendations to start with. Novice painters especially want these psi numbers to be "set in stone" for them and it is virtually impossible for any paint manufacturer or spray gun manufacturer to provide these.

What we have found is that the pressures that come into the guns are required to be somewhat higher than most folks think to allow the modern paints to be "busted up" or atomized. We have also discovered that if a recommendation of 45 psi is given, they mean 45 psi at the gun as the air enters into the end and not at the compressor. The pressure will drop dramatically from the compressor to the gun based on the length of air hose and its inside diameter. Also, it is important to learn that the pros use this air pressure recommendation with the ***trigger pulled*** and watch for the air pressure to drop and then become stabilized. This is the desired psi reading that is recommended… not with the gun at idle. We learned this first hand in a demonstration by a long-time pro painter that even has NASCAR (race car) experience.

Well, we learned that day that a big problem with orange peel and the large paint drops is that the air pressure most novice painters use is generally way too low. The amount of overspray created was much greater than we had ever seen with the new type HVLP guns. It reminded us of the overspray we used to see with the older siphon cup guns. The difference was that the particles were paint particles and not mainly thinner particles like the old days. The heavier paint particles seemed to end up where they belong… on the painted surface. The correct atomization with more air pressure created smaller (finer) paint droplets that flowed out smoothly. The correct temperature range thinner allowed the particles to then completely flow out and virtually eliminate any orange peel.

Other factors definitely enter into the picture and we will now discuss them.

The first is that the paint gun must be adjusted properly. This can require a learning curve. The fluid adjustment knob is the one that will govern how much paint comes out and how large or small the droplets will be once the air pressure is proper. The tendency is to "open up" the fluid knob to put out a lot of paint and allow the painter to move along rather quickly. This is the typical problem that a novice will have. The "wide open" fluid knob will result in large droplets or again, orange peel.

The amount of fluid coming out must be reduced in order to reduce the droplet size. This will mean that the amount of paint coming out is reduced and one must slow down the speed the paint is applied. The tendency is to move too fast and this results in dry spots where not enough paint is applied. Also, moving too fast will generally have novice painters forgetting to properly use an overlap spray pattern, adding to the dry effect. This all sounds hard, but it's not with a little practice and maybe some coaching from a painter friend… a ***PAINTER*** friend, not a guy who has only read articles about it!!

The next item to discuss is the size of the fluid needle/cap that the gun has. These numbers can be confusing at first, but they basically refer to the opening size that allows the paint to come through. Modern paints that are EPA compliant are generally thicker and require much less

thinner than the old paints, as mentioned previously. This requires gun tips (needles/caps) to be larger and specially designed for these modern paints. Most guns are now manufactured for these paints. Most primers (also called surfacers, or as we call ours - ***UV Blocking Primers***) require larger size tips because they are thicker than most paints. This allows for more primer to be applied in one coat and results in less paint and fumes in the air… thus the EPA is happier.

Each paint and gun manufacturer have basic recommendations for the sizes of the tips for the type of chemical being applied. We find that our own ***UV Blocking Primers*** can normally be applied very well with tips that range from 1.4 mm – 1.7 mm. The more professional guns seem to be more accurately made and will be closer to the 1.4 mm size. The cheaper import guns seem to be better in the 1.7 mm range. We use a 1.7 mm for ***UV Blocking Primer***.

Our ***Color Top Coats*** are much thinner than the ***UV Blocking Primers*** and will work very well with 1.3 mm – 1.4 mm tip sizes. Colors are normally thinner than primers or clear coats nowadays and still spray more like older (thinner) paints.

Our ***Clear Top Coats*** are one of the thickest in any industry and are formulated without the addition of thinners to allow application with the fewest number of coats. They also resist runs as much as humanly possible. This was our largest complaint with early developed clear coat chemicals we experimented with. They were thin and would run very easily… not good for us novice painters. Our ***Clear Top Coats*** also will "flash off" (dry) rather fast to help prevent runs and having dust settle into the paint as it dries. Most novice painters do not have dust free, heated paint booths, so our formulation really helps folks in their workshops. We generally use 1.4 mm size tips for applying our ***Clear Top Coats.*** By the time a novice painter gets to the ***Clear Top Coat*** application, they are usually pretty good with handling the spray gun and should be able to apply the chemicals with proper atomization and flow out.

Another point or two on guns is that normally professionals will use one gun to apply primers and another for colors and clears. The primers have abrasive particles in them and will wear out a paint gun if used repeatedly. This is not a problem for novice painters, because they do not spray every day or enough paint to wear out their guns. Also one does not want a "chunk of primer" to come through the gun accidentally… especially when applying the final ***Clear Top Coat.*** We use two different guns in our shop and utilize a "primer gun" with a 1.7 mm tip to apply our ***Filler/UV Blockers***. Our ***Color Top Coats*** are applied with a 1.4 mm tip, as are our ***Clear Top Coats***.

We provide complete spray gun "kits" that can be used to apply our chemicals quite well. The kits are imported and come with three spray guns… one for ***UV Blocking Primers*** with 1.7 mm tips, one for ***Color and Clear Top Coats*** and 1.4 mm tips. A smaller, handy touch up gun is also included and we use it for all our chemicals. The kits include two air regulators that fit on the paint guns and a cleanup brush package. Three different size spray cups that fit on the top are also included. The whole set comes in a plastic storage case. It is a good, economical setup and we honestly use one every few days ourselves in our shop. We've tried several of the import jobs… some are OK… some are junk. We finally found a setup that works well for the price.

The last item we want to mention is that most professional guns will apply our chemical very well with 1.4 mm tips. If they come with two tips, we choose a 1.5 mm for applying primer. Any suggestions that painters have for us, are also welcome. Those are a few "pearls of wisdom" we have gained over the years… now let's get back to applying our first coat of ***Black UV Blocking Primer***.

The working time (pot life) of the ***Black UV Blocking Primer*** is approximately 1 hour at 70 degrees with ***T-1*** through ***T-3*** thinners. However, do not "waste time" applying any mixed chemicals, as they can cure while in your paint gun… especially in warm weather. Never apply paint of any kind in direct sunlight either. ***We are not responsible for any equipment that might become unusable because catalyzed chemicals setting up in them.*** This is uncommon, but could happen…

The air-drying time for the ***Black UV Blocking Primer*** is approximately 2 – 3 hours at 70 degrees. This does not mean you can leave catalyzed chemicals in your spray equipment this long! Clean equipment up immediately after applying chemicals.

Allow the mixed chemicals to react (catalyze) with each other for approximately 5 minutes before pouring into your spray gun. Stir them again and remember to strain your catalyzed chemicals as you pour them into your spray gun with paper strainers.

We must assume that you or your painter is experienced with the equipment you will be utilizing. If you are not familiar with paint spraying equipment, try to get some help from someone that is experienced. If you plan to "learn on the job", this is OK, but practice on something other than your aircraft first. You will use extra chemicals, etc. to practice with, but this is the only good way to teach yourself how to spray and clean your equipment properly.

We normally leave our structures laying flat on workhorses when we spray our coatings to help prevent runs. Experienced (current) painters will probably elect to hang their structures vertically to help eliminate as much dust as possible. All our chemicals normally tack up dust free in 10 – 20 minutes, so we would rather live with a few dust particles instead of runs in the paint…

The mixture for spraying the first coat of ***Black UV Blocking Primer*** is very simple. You mix the chemical just as you did for the brush coat ***except*** you only need 1 part ***Universal Urethane Thinner***, instead of 30 parts.

The mixing ratio for the first sprayed coat is **4:1:1**.

This is simply 4 parts of the ***Black UV Blocking Primer***, 1 part ***UV Blocking Primer Catalyst*** and 1 part of ***Universal Urethane Thinner***. We use an HVLP gun with a 1.7 mm tip.

FIRST SPRAYED COAT MIXING RATIO:

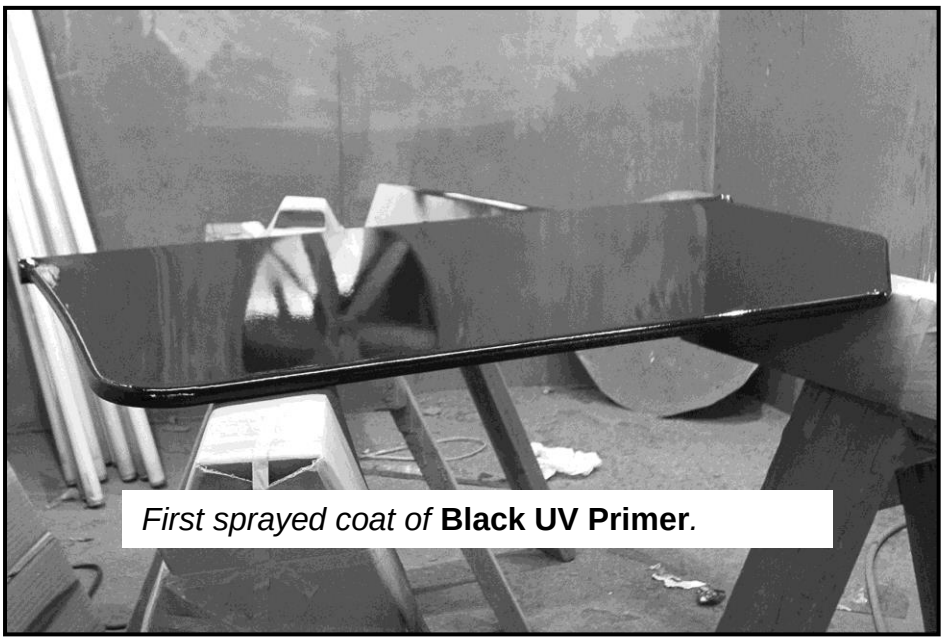
4 parts Black UV Blocking Primer

1 part Filler/UV Coat Catalyst

1 part Universal Urethane Thinner

Remember to mix the storage can contents well before measuring out the chemicals, as usual.

Don’t forget to blow off the entire surface to be painted and tack the surface with your tack rag, as before.



First sprayed coat of **Black UV Primer**.

Also don’t forget to use proper safety gear… fresh air respirator system, gloves, jumpsuit, etc.

Remember to strain your catalyzed chemicals as you pour them into your spray gun.

You will need to use more chemical with the sprayed-on coats than you did with brushed on first coat. You will find that the mixed ***Black UV Blocking Primer*** will cover very well and is equal to 3-4 coats of conventional “silver” type UV aircraft coatings. You will be spraying the ***Black UV Blocking Primer*** by spraying on ***one covering coat*** with our product. What this means is that you are not required to spray on one coat from “east to west” and then follow it up with another coat that is applied “north to south”. Other companies refer to this as “one coat”, but we think that is really two coats! You be the judge, but our coatings are thick enough to cover well with one pass of the spray gun… and we don’t apply a “tack coat” under our ***Black UV Blocking Primer*** coats either.

Start by spraying the mixed ***Black UV Blocking Primer*** over the first brushed on coat that you applied previously. On a wing, fuselage, or tail surface, we like to spray the first black coat along the longest length of the structure. We would say this was like an “east to west” pass or spanwise on a wing. North to south on a wing would be chordwise. You do not have to spray the full length of a long structure all at once. You can stop at a convenient point and work with even passes along this area. Once you have the area covered evenly, you then move down along to start on the next section.

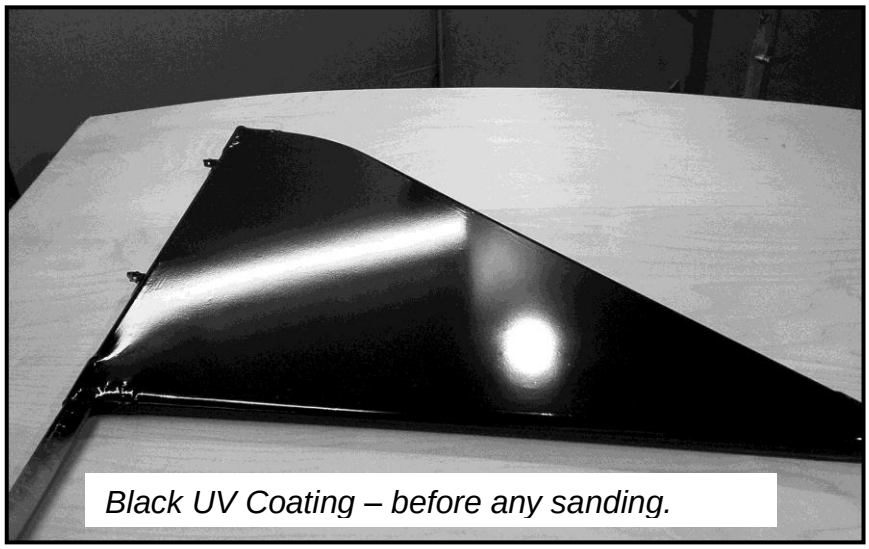
You will be able to see easily where the shiny, black coating is being applied. Don’t rush… work to spray even coats as you move along the structure. If you run short of the chemical, you can simply mix up more and continue. The chemical can then be added starting right at the last place you stopped. It may not be as shiny as the previous coating, but that is OK. Once the coating dries, it will sand beautifully even if the joining seam is a little rough. If the coating is not quite flowing out well enough and you are getting “orange peel” in the finish, you might want to use a slower thinner. The slower one would be the one that is for warmer weather… or if you are using

T-3, you might try T-4. You could also just add a little more thinner, but the system is really designed around the various thinners for flow rate. Extra added thinner will reduce the thickness of the coating as it is applied and it may not cover as well. You might also raise the air pressure on your spray gun. A little practice and you will be a pro.

Orange peel is small craters left in the finish when it's dry. Orange peel could also be caused by your spray gun being adjusted incorrectly. Refer to the previous information on spray guns.

This first sprayed on ***Black UV Blocking Primer*** will block UV radiation very well. Black is about the best color ever to block light rays.

Note - If you see any pinholes in the finish after you sand it, this will indicate the first brush coat is thinned too much. You can adjust the ratio for your exact fabric. Our ***Loehle Wonder-Fil*** can be easily be applied to any pinholes before the next spray coat. See the section on finishing composite parts for full details on using our great pinhole filler, ***Loehle Wonder-Fil***.



Black UV Coating – before any sanding.

Once you have allowed the first sprayed on ***Black UV Blocking Primer*** to dry, you can lightly sand any rough areas you might notice. Don't sand too much, just enough to knock off the high spots. Once you start any sanding, you will immediately see the next special improvement that we have added to our chemical coatings… the ***UV Blocking Primers*** dry shiny and once they are sanded, they turn to a flat looking finish. We have added special sanding agents allowing you to "dry sand" the coatings and see ***EXACTLY*** where the shiny low spots are. We think you will be very pleased with this special feature.

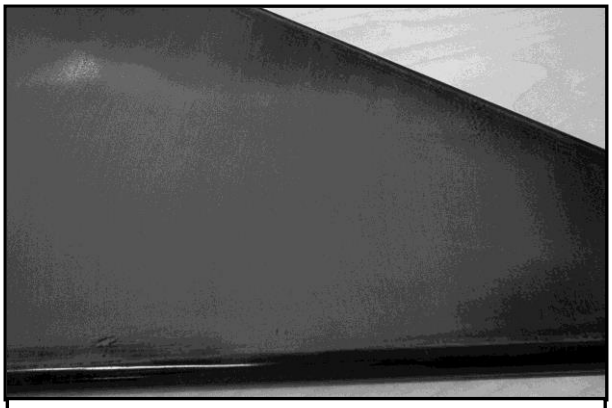
Wear a mask while sanding any chemically coated surface!

Any sanding that we do on our structures at this step, we do with 220 grit dry sandpaper. This may be a little course for first time workers, so you might want to use 320-400 grit dry sandpaper for this. You do not want to sand too far down and into the fabric. If you do sand too far, you can simply "spot spray" in that area to build the coating back up. 220 grit open coat dry sandpaper works best.

Light sanding with 220 grit dry

A little more sanding produces this!

Light sanding with 220 dry paper



Finishes like this!

Builders that like to "wet sand" their structures will find that our coatings will sand beautifully, but the "magic" shiny to flat system will not be seen as easily until the water dries.

APPLY SECOND SPRAY COAT OF UV BLOCKING PRIMER:

At this point in the procedure, you need to make a choice. An **OPTIONAL** second ***Black UV Blocking Primer*** can be applied. The optional coat will provide additional UV protection and will add more coating to fill tapes and reinforcing patch areas, etc. The additional coat will also allow you to sand the structure more than you will be able to if this coat is skipped. We like to add this second coat ourselves, especially on the upper side of the aircraft. This is where the sun will shine UV radiation on the aircraft. The option is totally up to you. More weight will be added somewhat, as will the overall cost to the project, but we feel the extra coating is well worth the effort… especially if you are trying to build an award winning aircraft.

Again, the mixing ratio is **4:1:1** for the ***Black UV Blocking Primer***, and below are more reminders.

Remember to mix the storage can contents well before measuring out the chemicals, as usual.

Don't forget to blow off the entire surface to be painted and tack the surface with your tack rag, as before.

Also don't forget to use proper safety gear… fresh air respirator system, gloves, jumpsuit, etc.

Remember to strain your catalyzed chemicals as you pour them into your spray gun with paper strainers.

If you elect to add the second coating of ***Black UV Blocking Primer***, we spray the chemicals in the opposite direction than the first sprayed on coat. We normally spray our second coat of ***Black Filler Coat/UV Blocker*** fairly soon after the first coat. The time we wait is simply long enough to allow us to sand out any major blemishes. We do not sand the entire structure before adding the second coat. You could sand the whole thing, but we don't see the need.

Note that if you were spraying our system for hire, you could allow as little as 5 – 10 minutes between coats of our ***Black UV Blocking Primer***. Our system requires fewer coats and dries rather quickly. We have applied every chemical we use in our system in one working day! The chemicals will allow this, but we like for folks to allow the three basic chemicals to cure overnight between applications.

If you are not going to add additional coats of ***Black UV Blocking Primer*** right away, you should sand it before adding additional coats. If you sand a surface and can't add additional coating right away, it's OK. You have up to seven days to coat it without additional sanding. After this time, it's best to scuff sand the surface with a red or gray nylon pad.

APPLY WHITE SPRAY COAT OF UV BLOCKING PRIMER:

Now it's time to spray on the ***White UV Blocking Primer***. The procedure is the same as you did previously with the ***Black UV Blocking Primer***. The only real difference is simply the chemical is white.

Various aircraft coating companies recommend that you paint ***your entire aircraft*** in an overall white coat ***before*** painting on the color coats. The purpose of this additional step is to allow the colors to be more vivid and rich looking. Coating an entire aircraft with a white coat, over a silver base coat, seems to be a whole lot of additional trouble and expense to us. We designed our entire system to have a white base coat included prior to the color paint being applied… it is not an after thought.

The mixing ratio is again **4:1:1.**

WHITE SPRAYED COAT MIXING RATIO:

4 parts White UV Blocking Primer

1 part UV Blocking Primer Catalyst

1 part Universal Urethane Thinner

Remember to mix the storage can contents well before measuring out the chemicals, as usual.

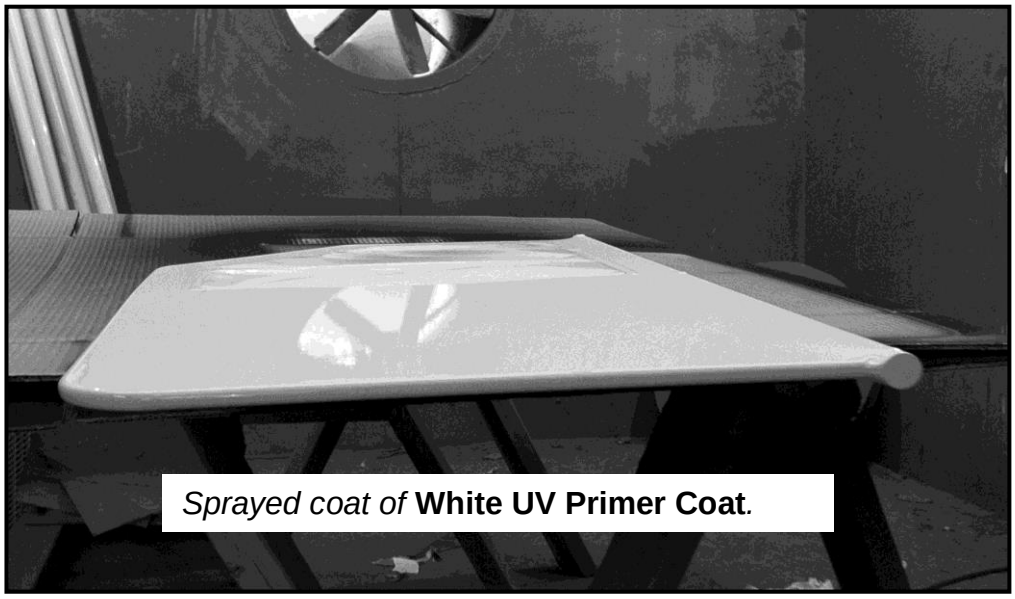
Allow the mixed chemicals to react (catalyze) with each other for approximately 5 minutes before applying.

Don't forget to blow off the entire surface to be painted and tack the surface with your tack rag, as before.

Also don't forget to use proper safety gear… fresh air respirator system, gloves, jumpsuit, etc.

Remember to strain your catalyzed chemicals as you pour them into your spray gun.

As previously stated, do not "waste time" applying any mixed chemicals, as they can cure while in your paint gun… especially in warm weather. Never apply paint of any kind in direct sunlight either.



Sprayed coat of **White UV Primer Coat**.

Start spraying the mixed ***White UV Blocking Primer*** right over the ***Black UV Blocking Primer***. You will be amazed that the white coating is so thick that it will cover the black coating in one single pass!! If the white is not covering in one pass, you're moving too fast or you failed to properly mix up the contents in the storage can!

It is really easy to see the color contrast of the white over the black as you apply it and you will like the ease of application. The contrast will be even more dramatic than when you brushed the black coat onto the white fabric.

You will be ready for final sanding after the ***White UV Blocking Primer*** dries.

SAND THE WHITE SPRAY COAT OF UV BLOCKING PRIMER:

Sand the ***White UV Blocking Primer*** smooth with dry sandpaper to get it ready for your ***Color Top Coat***. The white coating will sand just like the black coating. You will be able to see any blemishes similar to the way you did with the black coat because the coatings are the same except for their pigment color.

When you sand the white coating, you might go too far and get down into the black coating. Never fear, as this is another beautiful benefit of using our unique products… the black will indicate where you are while sanding and prevent you from sanding down to the fabric. Accidentally sanding all the way through to the fabric is quite normal with covering systems that use older style silver coatings that are put on in six plus layers (coats). This has been a problem for years, especially for novice builders.

If you do sand into the black layer, simply spot spray additional white on the areas… no big deal. Sand the touch up areas after they dry.

We use 400 – 600 grit dry sandpaper for this step. Any real rough areas could be sanded carefully with 220 grit paper to speed things up and final sanded with the 400 – 600 paper. Sand the entire structure. Remember to wear a dust mask while sanding. Also, you can obviously wet sand everything if you like.

Any sanding with paper under 400 grit can possibly show in the next ***Color Top Coat***. After sanding, you will be ready for a colorful top coating.

APPLY COLOR TOP COAT:

Congratulations! You are now ready to apply the color to your aircraft.

The mixing ratios are the same as you used previously, except this time you will need to add a ***Flexible Additive***. We have been able to get our chemists to allow us to formulate our chemicals with the required flexible agents in all of our products before shipping them out to customers, except our ***Color Top Coats***. They still need the agents added at actual mixing time…

The mixing ratio for the ***Color Top Coat*** is 4**:1:2:1**. This is simply 4 parts of the ***Color Top Coat***, 1 part ***Color Top Coat Catalyst, 2*** parts of ***Universal Urethane Thinner*** and ½ part of ***Color Top Coat Flexible Additive***. NOTE: Any extra flex added when mixing is ok.

The working time (pot life) of the ***Color Top Coats*** is approximately 4 hours at 70 degrees with ***T-1*** through ***T-3*** thinners. Once again, do not "waste time" applying any mixed chemicals, as they can cure while in your paint gun… especially in warm weather. As stated before, don't apply paint in direct sunlight.

The air-drying time for the ***Color Top Coats*** is approximately 50 minutes for dust free at 70 degrees and full cure is overnight. A faster drying time can be achieved by using our faster thinners. Professional paint shops love this feature. Even our ***Accelerated Thinner*** can be used if needed.

Remember to mix the storage can contents well before measuring out the chemicals, as usual.

Allow the mixed chemicals to react (catalyze) with each other for approximately 5 minutes before applying.

Don't forget to blow off the entire surface to be painted and tack the surface with your tack rag, as before.

Also don't forget to use proper safety gear… fresh air respirator system, gloves, jumpsuit, etc.

Remember to strain your catalyzed chemicals.

Recommended spray pressures for the two types are as follows:

Spray at 25 – 45 psi for HVLP guns

Spray at 45 – 60 psi for siphon feed guns

Vary air pressures as you need to for your system. Refer back to the spray gun section if needed.

Shiny **Color Top Coat**.

This chemical sprays very well and is similar to most urethane type coatings used by various companies. Our chemical does not seem to create runs as easily as some aircraft urethane coatings however. Our chemical formula is designed to allow amateur folks to produce beautiful paint jobs.

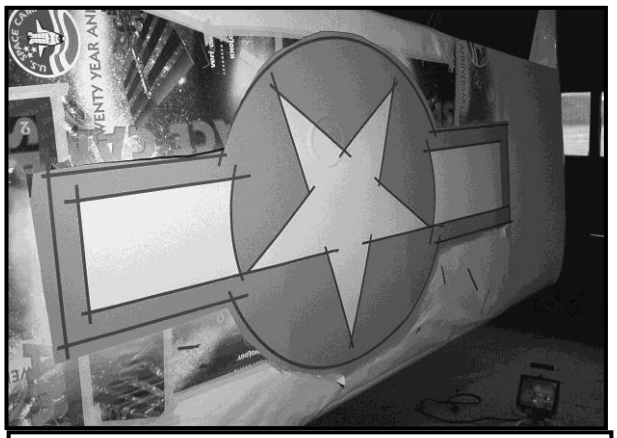
The ***Color Top Coats*** are applied somewhat different than the ***UV Blocking Primers***. These coatings are not as thick as our ***UV Blocking Primers***, so we will spray on a typical light "tack" coat to the structure. A tack coat is simply a light coat that is thin and will not even have a chance to run. It will form a thin layer for the full coat to bind to. Let the tack coat set up for 5 – 10 minutes before adding the full coat. We like to spray our tack coat along the shortest side of the structure, so we can spray the full coat along the long side. This allows the long side coat to have as few stopping points possible. This may seem a little confusing, but basically you used the same methods applying the ***UV Blocking Primers***. The best example is that we would spray a wing by applying a tack coat from the trailing edge to the leading edge or chordwise (north to south). The full coat would then be sprayed from the root to the tip or spanwise, (east to west). You will be able to stop at a convenient point, just as you did with the ***UV Blocking Primer***, but it is best to keep moving so the gloss of the ***Color Top Coat*** will not flatten out. This is not hard to do and even less important since we add our ***Clear Top Coat*** next. If it is dry in places, don't worry about it…you will be covering it with ***Clear Top Coat.***

The full coat should cover well and not require an additional coat if applied evenly. If you have light areas, you will need a second coat. We normally run an additional coat like this in the opposite direction from the last one.

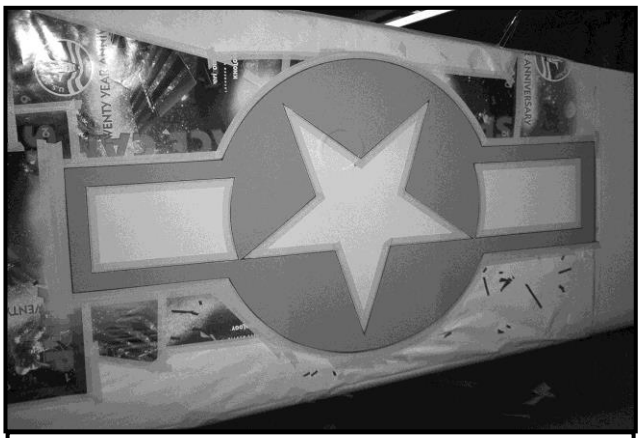
Before adding our protective ***Clear Top Coat***, you can even sand out any runs you might accidentally get and spot spray more color on. Use 400-600 grit sandpaper if you need to sand anything.

If you need to apply additional color, try to do it within a day or so of the previous coat. Otherwise, you will need to scuff sand the structure. Use a red or gray nylon pad to scuff with, if you need to. It is best to plan out your work so you will not need to scuff the color coat. The color coat is somewhat thin. We do not sand metallic colors, as scratches will show many times.

Trim colors can be applied the following day without sanding if you like. Honestly, we have never seen any of our chemicals lift, even if the coat prior was not sanded… light scuffing is really proper though.



1/4" fine line plastic masking tape



3/4" paper masking tape added to 1/4" plastic tape.

Be sure to use only a good grade of masking tape for any taping you do on your project. We use only professional fine line 1/4" blue plastic masking tape for ***ALL*** our trim work. It provides a perfect, sharp trim line when removed. The plastic tape is available in wider widths of ½", ¾" and 1" also for nice, long very straight lines. 1/8" is available for nice tight curves.

High quality 3/4" paper masking tape is then placed over half of the blue fine line tape to attach masking paper. Never use cheap masking tape. It does nothing but cause unexpected problems.

Only use true painter grade masking paper and never use newspapers. Some folks try to cut costs on paper and pay a big price for this. Ink is commonly released onto the project when paint hits it. Newspapers also have small holes in them that the paint loves to find and travel through!

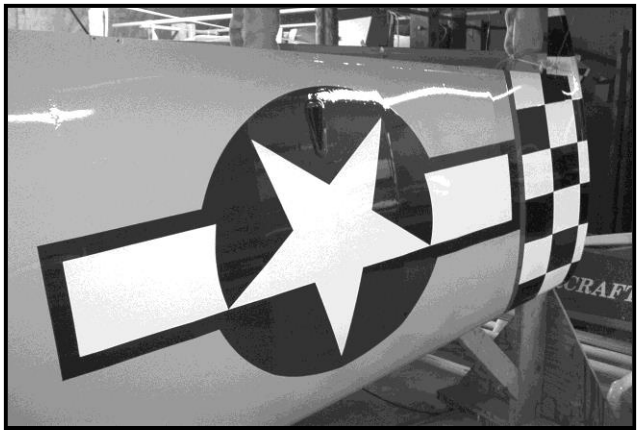
APPLY CLEAR TOP COAT:

The final step in creating an award-winning aircraft is to apply our ***Clear Top Coat*** over the top of the ***Color Top Coat***. It seals all the color and trim colors, along with any graphics and decals with a chemical proof layer. Nothing is more disheartening than to have a permanent mark across

a nice decal simply by having a tool or fuel nozzle accidentally run across it! Scratches will be eliminated with our ***Clear Top Coat***.

Our ***Clear Top Coat*** system was the only one that we know of offered in the aviation industry until recently. The fabric aircraft covering companies we have worked with over the many years all say that you shouldn't clear coat. Some even sell clear, but they don't recommend using them… they say theirs will yellow, especially over time. We have clear coated our Loehle Aircraft designs for years. Our ***Clear Top Coat*** remains clear and one of our demonstrator planes has 10+ years of service on it without any yellowing of the clear! Clear can be said to add some weight and cost to the project, but the effort has always been worth it to us. We know other folks agree, because we have been asked for years to bring our whole unique system to the general public. We finally agreed to their requests and **Loehle Coatings with *Ultra-Flex* Technology** are the results!

Beautiful sun burst trim.



Vinyl star graphics, 1" wide colored trim tape and hand masked black & white checkerboard!

The mixing ratios for our special ***Clear Top Coat*** is rather simple, but note that the ratios are slightly different that the previous coatings.

The mixing ratio for the ***Clear Top Coat*** is 4**:1.** This is simply 4 parts of the ***Clear Top Coat***, 1 part ***Clear Top Coat Catalyst***.

The ***Clear Top Coat*** storage can contents will not be required to be mixed, as other chemicals are.

The working time (pot life) of the ***Clear Top Coat*** is approximately 1 hour at 70 degrees. The air-drying time for the ***Clear Top Coat*** is approximately 15-20 minutes for dust free at 70 degrees and full cure is approximately 4 hours. We utilize 3 separate temperature range ***Clear Top Coat Catalysts*** for this.

Our "***Fast" Clear Top Coat Catalyst*** is used below 60 degrees. Our ***"Medium" Clear Top Coat Catalyst*** is used from 60-70 degrees. Our ***"Slow" Clear Top Coat Catalyst*** is used in temperatures above 80 degrees. They simply allow the ***Clear Top Coat*** to flow out properly.

Allow the mixed chemicals to react (catalyze) with each other for approximately 5 minutes before applying.

Make sure your spray gun is ***completely*** clean and free from any colored paint particles or they will pass through and into your ***Clear Top Coat*** as you apply it. This will ruin your day, so be sure no metallic particles are still floating around in your spray gun.

Remember to use paper strainers to strain your catalyzed chemicals as you pour them into your spray gun.

When applying ***Clear Top Coat,*** try to do it within a day or so of the previous ***Color Top Coatings***. Otherwise, you will need to scuff sand the structure. Use a red or gray nylon pad to scuff with, if you need to. It is best to plan out your work so you will not need to scuff the color coat.

As stated previously, we have never seen any of our chemicals lift, even if the coat prior was not sanded… light scuffing is really proper though.

We normally wait until the following day to apply ***Clear Top Coat*** after spraying on ***Color Top Coatings***. This is not mandatory, but it's best. We have applied every chemical we use in our system in one working day! The chemicals will allow this, but we like for folks to allow the three basic chemicals to cure overnight between applications. Our system is wonderful for production paint shops though, because of "all in one day" application is possible.

Don't forget to blow off the entire surface to be coated and tack the surface with your tack rag, as before.

Also don't forget to use proper safety gear… fresh air respirator system, gloves, jumpsuit, etc.

Recommended spray pressures for the two types are as follows:

Spray at 25 - 45 psi for HVLP guns
Spray at 45 – 60 psi for siphon feed guns

We use an HVLP gun with a 1.4 mm tip. Vary the air pressure as you need to for your system.

At this point in the project, you will be familiar with applying coating with your spray system. We apply our ***Clear Top Coat*** a little different than our ***Color Top Coats***. The we apply our first coat heavier than a normal tack coat. The mixed chemical is thicker than mixed ***Color Top Coats*** and resists runs. Our ***Clear Top Coat*** is formulated to allow this. You will like this product very well. We sure do!

We now apply our ***Clear Top Coat*** using what is called a "wet on wet" coat. The first coat is applied using a full wet coat in one direction followed by a full coat in the opposite direction. This final ***Clear Top Coat*** should be applied without stopping (running short of chemical) to prevent "dry spots" in the finished product. This is one time that it is best to have some extra chemical mixed up even if it will be wasted. The only way to be "on the mark" when mixing any painting chemicals is with experience.

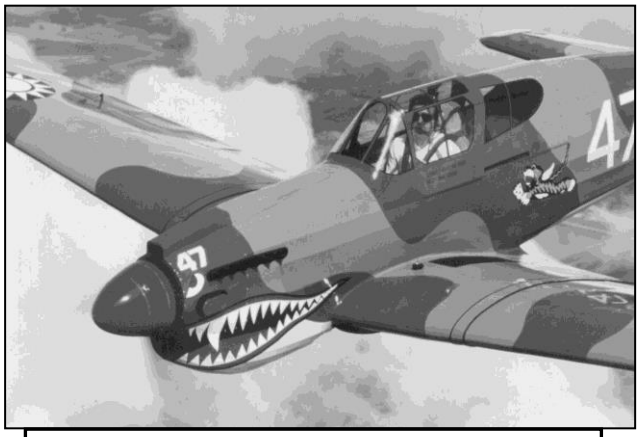
One point to consider is that most amateur painters have trouble with trying to keep the finish "wet" overall. This is something that only comes with experience (shooting paint daily). We normally elect to clear coat our structures in stages. When we coat a wing, we coat one side at a time. We mask the first side completely, before spraying the second side. This assures that you can keep things wet and glossy. A small seam will be present, but we've never even had folks notice… As we mentioned previously, we normally leave our structures laying flat on workhorses when we spray our ***Clear Top Coat*** to help prevent runs. Again, experienced (current) painters will probably elect to hang their structures vertically to help eliminate as much dust as possible.

Well, at this point you have completed an entire structure from start to finish. The remaining components for your aircraft will just be repetition.

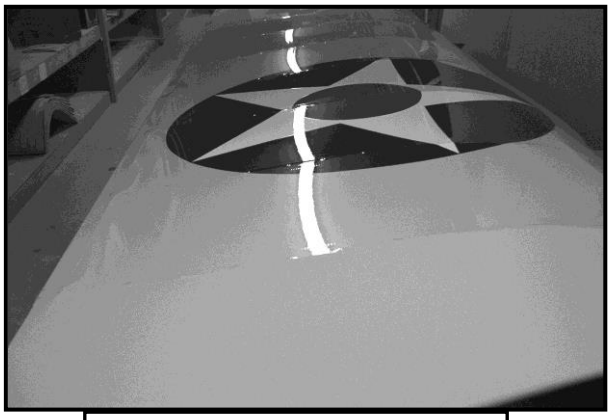
Unmask all areas where you might have placed masking tape and then take a moment to congratulate yourself… a good celebration dinner might even be called for!

Clear Top Coating *applied to our* ***LOEHLE*** *factory "5151" Mustang… right wing was clear coated and the left one was not. Rather obvious in this photo!*

To the best of our knowledge, this "5151" Mustang was the first aircraft to ever hit the airshow circuit with ***Clear Top Coating*** and over the vinyl decals… **in 1988**… most folks do it now.



Clear Top Coat *on* **LOEHLE** ***factory P-40 Flying Tiger****. Note reflection of numbers and tiger on left wing.*



The power of our unique **Clear Top Coat***!*

REPEAT ALL THE PROCEDURES FOR REMAINING COMPONENTS:

Now you simply need to repeat the procedures for all your remaining components. Remember to paint any screws, inspection plates and trim pieces as you go along.

We place all our screws that we want to paint onto heavy cardboard. We poke holes in the cardboard with an ice pick, etc. for the screws.

We use duct tape to hold down inspection plates and small trim pieces to heavy cardboard for spraying.

The painting of composite and metal parts will be covered in the remaining paragraphs. A comprehensive addition at the end of this manual discusses painting a popular all metal aircraft.

PAINTING OF METAL COMPONENTS:

Painting of metal parts are really simple and we will advise you of the methods we have used for 40+ years.

We sand our metal parts with 220 – 400 grit dry sandpaper or a gray nylon pad to prepare them for paint. Many folks have elaborate procedures for metal preparation, but we simply clean our metal parts with ***Surface Cleaner***, ***Lacquer Thinner*** or ***Universal Urethane Thinner*** after scuffing them. Various chemicals that will improve adhesion and they should be used for an all-metal aircraft. We do not metal-etch or "Prekote" add-on metal pieces. Sheetmetal panels and inspection plates that we have painted with our coatings have never shown any adhesion problems.

A complete all metal aircraft is different. For that information, refer to the additional information included at the end of this manual.

You should use our ***Etching Primer*** if you are coating a steel tube structure after sandblasting. The primer is the color of aircraft zinc chromate (greenish/yellow) and is ***the*** chemical for metal. This chemical is now replacing epoxy primer throughout industry.

The panels are then coated with one good coating of our ***White UV Blocking Primer*** mixed just as you do for fabric covered aircraft. Then they are sanded and coated with ***Color Top Coats*** and/or ***Clear Top Coats***. The entire system for metal parts is really that simple.

The black color is not required, as we aren't really concerned with UV radiation harming the underlying metal.

The mixing ratio is **4:1:1**.

This is simply 4 parts of the ***White UV Blocking Primer***, 1 part ***UV Blocking Primer Catalyst*** and 1 part of ***Universal Urethane Thinner***.

Remember to mix the storage can contents well before measuring out the chemicals, as usual.

Don't forget to blow off the entire panel to be painted and tack the surface with your tack rag, as before.

Also don't forget to use proper safety gear… fresh air respirator system, gloves, jumpsuit, etc.

Refer to the previous paragraphs regarding the application of ***Color Top Coats*** and/or ***Clear top Coats***.

PAINTING OF COMPOSITE COMPONENTS:

Composite parts are treated just about the same as metal parts. Again, refer to the information on composites included at the end of this manual.

The best thing you should do when you begin is to completely install the composite part, drilling any required holes, cutouts, etc. Sand any edges that are rough.

After fitting the part, it must be washed well with a good soapy cleaner solution. We can use common dish washing soap for our parts and most multi-purpose household cleaners will work well. The purpose of this is to remove any mold release that is on the part. Mold releases are really a type of wax, so paint is not going to stick very well!

Use hot water if at all possible.

Dry the part well, if you plan to dry sand the part. If you plan to wet sand it, then proceed on with it.

We dry-sand our parts with 220 – 400 grit dry sandpaper to prepare them for paint.

We have never seen adhesion problems on composite parts that we have coated with our products.

The parts need to be completely dry before you proceed with the application of coatings. If the parts show pinholes, ***Loehle Wonder-Fil*** should be applied. Apply ***Loehle Wonder-Fil*** just as you would for a paste type auto or aircraft wax. Wipe ***Loehle Wonder-Fil*** onto the composite surface with a clean paper towel, cotton cloth or polishing type pad. Work the chemical into any

and all holes that are present. A typical circular polishing type motion works very well and will automatically force the chemical into the pinholes.

Allow the ***Loehle Wonder-Fil*** to dry to a thin white colored haze. A few minutes is all that is normally required. Wipe off the excess chemical from the top surface with a clean paper towel or cotton rag. The holes should remain filled and ready for painting. No additional sanding is required before painting. The ***Loehle Wonder-Fil*** will permanently bond with every painting chemical we've tested to date. Essentially the ***Loehle Wonder-Fil*** becomes a filler or thickening agent for the paint. It even works well with clear coats and becomes magically transparent!

It really is that simple...

We recommend coating all composite parts with our ***Black UV Blocking Primer.*** This coating will allow any and all blemishes and pinholes to be seen after dry sanding. All blemishes will magically go away with the use of the ***Black UV Blocking Primer.*** The ***Black UV Blocking Primer*** also protects the composite part from UV radiation.

The parts are then coated with one good coating of our ***White UV Blocking Primer*** mixed just as you do for fabric covered aircraft. Then they are sanded and coated with ***Color Top Coats*** and/or ***Clear Top Coats***.

If you are painting an entire composite aircraft, you should refer to the manufacturer's specific instructions. We are more than willing to chat with them directly, if required.

PAINTING OF PLASTIC COMPONENTS:

First off, let us say that the painting of plastic parts has notoriously been a problem. Our chemical formulas are some of the most advanced on the open market today and actually are designed to include plastic part processing. We all know that the use of plastic is more and more common each day. We would be naive to overlook them in our special chemical formulas.

Cleaning and surface preparation is the most important item when working with plastic components. Flexibility used to be the biggest headache, but our formulas are some of the most flexible anywhere today… thus we say our products have **Loehle *ULTRA-FLEX* Technology**.

The first step is to clean the plastic parts thoroughly with our ***Plastic Surface Cleaner*** to remove any oils or waxes that may have been used in the manufacturing process of the part.

Next, you will need to sand the part with 600 grit sandpaper and our ***Plastic Scuffing Gel***. Obviously, you will need to use wet sandpaper for this operation.

Rinse the part off well and allow it to dry thoroughly.

Once dry, apply a light coat of our ***Plastic Adhesion Promoter***. Allow about 10 minutes for this to dry and then immediately apply a coating of ***White Filler/UV Blocker***. Proceed with finishing the part as you would with our ***Color Top Coats*** and/or ***Clear top Coats***.

FINAL SUMMARY:

Finish all your component painting and carefully reassemble your aircraft project. Remember to have your project inspected, as required.

Follow all the proper testing procedures that you should do and ***most of all***, stay safe and fly carefully.

This in-depth manual has covered many topics and we've tried our best to explain our products and methods. We're sure that they will be revised numerous times in the future, so be sure to check with us on the most revised copy before you actually begin your coating process. Thanks to everyone who requested us to enter into this fun, satisfying coating industry. We feel blessed that we can help provide valuable knowledge and products for builders to create fabulous looking flying machines!

Additional information follows in an article reprint/manual on painting a Van's RV-10 metal and composite aircraft.

LOEHLE COATINGS ON RV AIRCRAFT

More and more RV builders are using Loehle Coatings when it comes time to work on the fiberglass parts, and have realized the same paint will also work on the rest of the airplane as well. Loehle Coatings is formulated for metal, composite (and fabric), so all the primers, color and clear can be from the same paint process.

One reason RV builders are initially drawn to the Loehle process is that Mike Loehle has come up with a 15 minute wipe-on/wipe-off fix for pinholes called Loehle Wonder-Fil. This reduces all the filling/sanding/filling/sanding usually required to properly finish the composite cowlings, wheel pants, etc. Following up with the Loehle Black UV Blocking Primer, then White UV Blocking Primer continues this quick filling, smoothing process and brings the composite parts up to the same stage as the first coat of White UV Blocking Primer for the aluminum. The whole airplane can have the same foundational white so whatever color is chosen can be a true, vivid color. The Loehle Coatings process allows just about any color you can think of….all of them an extremely "wet-look" shiny finish.

Mike has painted an RV-10 for Maj. Gen. (Ret.) John Miller who is a former 3 time wing commander, including the F-117 Stealth program. Mike has agreed to share a bit of history and some technical insight on applying Loehle Coatings to an RV aircraft…..

Photo A – John Miller's RV-10 before – in the rough

Photo B – John Miller's RV-10 after – finished in Loehle Aero Coatings
(John Miller - gengrumpy@aol.com.)

By Mike Loehle

I'm honored to have been asked to share my painting experience with all the Van's RV aircraft builders. I'll start by giving a little history on our company, along with the reason I created my own painting process.

Photo C - Mike Loehle

Our process has actually been developed over a LONG period of time. I first started working with aircraft painting on fabric covered aircraft in the late 1970's and really started experimenting with various paint process and chemicals while working on Piper Aztecs and single engine Cessnas. I started mixing various chemicals together way back in 1981 to attempt to create a shiny, chemical resistant coating for use on my ultralights. An Oshkosh Grand Champion trophy was the result.

Over the years, I have worked with nitrates, butyrates, lacquers, vinyls, enamels, urethanes and even latex type paint chemicals. I have experience with most of the aviation paint products on the market. All work on aircraft, but some are much better and much more durable. Paint has come a long way over the years and urethanes are the most advanced paint chemistry available today. They are really industry standard now in virtually all fields…auto refinishing, custom street rods, custom motorcycles, industrial machinery and probably even the boat refinishing business. Aviation has often been the last to adopt changes in paint technology. This is a shame and the aviation consumer really doesn't get the latest improvements that come down the pike.

I started producing aircraft kits as a teenager (40+ years ago) and our crew included three generations working with our designs and painting system (my dad, brother, wife and two sons). Our history included experience in many facets of aviation…general aviation, homebuilts, ultralights, and even rotorcraft. We designed primarily replica fighter aircraft, with our most well known being the "5151" Mustang, a 3/4 scale version of the P-51 fighter. We also designed and kitted a P-40, KW-909 (a ME-109/FW-190 look), Spad XIII, Fokker D-VII, and an SE5a. Our Sport Parasol was not a warbird replica, but definitely a nostalgic classic. The aircraft company is now closed and I am focusing strictly on providing coatings and knowledge for builders and restoration/paint shops.

My main goals working with paint for use on my own factory kit demonstrators were to create the most flexible coatings available and the easiest to apply. These were self-serving goals that we now are privileged to help folks with worldwide.

What I will be discussing in detail is how our process can help Van's builders with their own projects. I'll describe the basic steps I used to paint a customer's RV-10 and then I'll go into detail about each step. I have been asked by RVator's Ken Scott to make the discussion more on the technical side, as RV builders want <u>all</u> the technical details and that suits my style perfectly…being of German ancestry (Loehle), we too excel in the fine details! The details are numerous, but builders' knowledge varies greatly, so I'm attempting to include as much information as a beginner painter might need.

Basic Steps

In a nutshell, here's what you'll be doing:

1. Wash and prep all parts for application of ***Loehle UV Blocking Primer***.
2. Apply ***Loehle Wonder-Fil*** on composite parts.
3. Apply ***Loehle Black UV Blocking Primer***.
4. Apply ***Loehle White UV Blocking Primer***.
5. Apply ***Loehle Color Top Coating***.
6. Apply ***Loehle Clear Top Coating***.

It sounds simple enough and it really is, if taken one step at a time, but there are details that will make a big difference in just "painting something" or winding up with a finely crafted paint job to match the craftsmanship you've accomplished thus far.

Van's Aircraft are, as most folks know, composed of primarily sheet metal with composite parts mixed throughout. The most widely asked question for us from Van's builders is about finishing the composite parts and especially the "dreaded pinholes." I'll begin explaining our coatings and their unique properties when we finish RV glass parts, and move on to painting the metal parts as well. ***Loehle Coatings*** are purposely geared for metal, composite, and fabric surfaces.

Composite Parts

The initial step for all composite parts is to trim and fit the part to the aircraft. We don't even wash or sand the part until it is properly fitted and all holes and cutouts are finalized. Naturally, if one has to add fiberglass cloth and resin, then the applicable area should be washed and sanded per proper laminating procedures. Many builders will eat up a lot of time sanding on the blemishes in parts and actually opening up the glass surface and pinholes prior to properly fitting parts to the aircraft. This can allow dirt and grease to get into the surface of a part, only to cause paint problems later.

When the part is properly fitted, wash the part in hot (if possible), sudsy water to remove any mold releases, wax, oil and dirt from the part. This should be done before one begins sanding so as to not "spread" contaminants around and into areas as sanding takes place.

Detergents such as Simple Green and Dawn dish soap work well…just don't use a soap that has hand lotion mixed into it!

The finish on composite parts varies greatly from manufacturer to manufacturer and the amount of sanding and filling required also varies greatly. Like most in the industry, Van's parts are normally supplied unprimed. The parts will need to be sanded to remove the shiny finish so filler and primer will properly adhere.

Photo 1 – Lower half of RV wheel pant has been dry sanded. Upper half is still shiny before sanding.

We normally prefer to dry sand our parts so as to not introduce moisture into open pinhole areas. (Be sure to wear a good, properly fitting dust mask when sanding.) We scuff sand the surface with sandpaper grit ranging from 150 to 220. The paper we use and supply is designed for dry use and is white in color. Black wet/dry paper will clog rather quickly when dry sanding. We learned a tremendous amount about sandpaper years ago when we produced our wooden Ritz propellers at our factory. Dry sanding was an obvious choice when working with wooden prop blanks so "wet wood" was never a factor. As many as 50 props a day were produced and four coats of flexible urethane were applied per prop. Each coat was sanded prior to the next, so a vast amount of sandpaper was used daily. The paper that eliminated clogs best is what we now use finishing glass parts.

What Are Pinholes?

The number one problem Van's builders complain about is pinholes. A pinhole is really just an area of a composite part that was starved for resin when the part was produced. The glass cloth is dry and will continue to soak up any liquid that enters the pinhole. Never fear though, we have a product that will actually fill them!

I'm going to describe pinholes more for those who have not yet been plagued by them. They are tiny holes in a surface that normally will repel a paint primer that is applied to an unsanded part. The reason is that a pinhole is kind of like a miniature volcano: it has a slight lip that helps repel liquid primer….actually the thinned primer will try to flow around the lip of the pinhole instead of down into it. Surface static adds to it wanting to flow around the hole.

Sanding will remove the "volcano lip" and primer will then flow down into the pinhole. The problem then is that the dry fiberglass cloth will keep on soaking up the primer until the cloth is totally saturated. This may take many coats of primer, which is very frustrating to say the least.

Loehle Wonder-Fil – The 15 Minute Solution for Pinholes

We have a special product called ***Loehle Wonder-Fil*** that is just the ticket for pinholes. Years ago we wanted to hide sanding scratches in our wooden propellers and that's actually where ***Wonder-Fil*** started in our paint process. The chemical is actually a simple paint thickener and mixes with any primer, paint or even clear coatings. It mixes so

well on the spot that the sanding scratches disappeared on our clear coated propellers. When used to fill composite pinholes, it simply plugs the hole so primer will not continue to flow "forever" into the dry cloth! An old timer explained that they used to fill sinkholes in the ground with dried beans. Then when they soaked them with water, the expanded beans would plug the hole long enough for concrete to set! This is the basic principle in action with our ***Wonder-Fil*** on a composite part. The primer and the ***Wonder-Fil*** are permanently bonded together.

*Photo 2 – **Loehle Wonder-Fil** showing pinholes in honeycomb areas on RV-10 cowling.*

*Photo 3 – **Wonder-Fil** showing pinholes in honeycomb areas on RV-10 cowling.*

After sanding a part, it should be blown off with dry compressed air to remove the sanding dust. ***Surface Cleaner*** should be used prior to applying our ***Wonder-Fil***. Our ***Loehle Wonder-Fil*** is then simply applied as if you were hand waxing a car. It is applied with a paper towel, soft cloth or applicator type sponge in a circular motion. The ***Wonder-Fil*** will be forced into the pinholes. We allow ***Wonder-Fil*** to dry (about 10 to 15 minutes) until you see a whiteish haze

Photo 4 – Whitish haze shown on upper cowling before wiping off surface with towel.

on the part's surface and then wipe off the surface residue with a clean paper towel or soft cloth, leaving the dried ***Wonder-Fil*** in the pinholes. White specks will be noticeable and you will then be amazed how many pinholes your part has!

*Photo 5 – RV wheel pant nose with **Black UV Blocking Primer** sprayed on before any **Wonder-Fil** was used – pinholes really show up then!*

Moving On to Primer

The part is now ready for our unique ***UV Blocking Primer***, which is a primer/surfacer. The ***UV Blocking Primer*** comes in either Black or White and is designed to fill or build up mil thickness quickly. We'll be using the special ***Black UV Blocking Primer*** on composite parts and will use the ***White UV Blocking Primer*** later (before spraying color).

*Photo 6 – Fabric weave and honeycomb lamination clearly shows up after applying **Black UV Blocking Primer** coating. Additional Black will fill in these areas.*

The initial spray coat of ***Black UV Blocking Primer*** will help fill the weave of the composite fabric and block UV radiation (sunlight) that can destroy a part's strength over time.

Our ***UV Blocking Primer*** are formulated to spray on in one single pass of a spray gun…not several light cross coats as thinner paint coatings normally require. Remember, high build was my goal. Fabric covered aircraft will take four to eight coats of silver to block ultraviolet radiation (sun rays) that will harm the covering fabric. A 60 watt light bulb is normally held behind the sprayed fabric to check for light penetration. We pass the same test with one single slow pass of our spray gun! I know you're not dealing with fabric, but I'm just explaining how effective the protection is with just one coat.

<u>"Super Sandability"</u>

Now I'll discuss the best feature of our ***UV Blocking Primer***. They dry to a semi-gloss to glossy finish and have special sanding agents in them to allow the coating to be flexible, yet not clog sandpaper. When they are dry sanded with open coat sandpaper, the shine disappears

*Photo 7 – Shiny finish of **Black UV Blocking Primer** before sanding windshield area on RV-10.*

*Photo 8 – Obvious comparison of sanded and unsanded **Black UV Blocking Primer** on upper half of RV-10 cowling.*

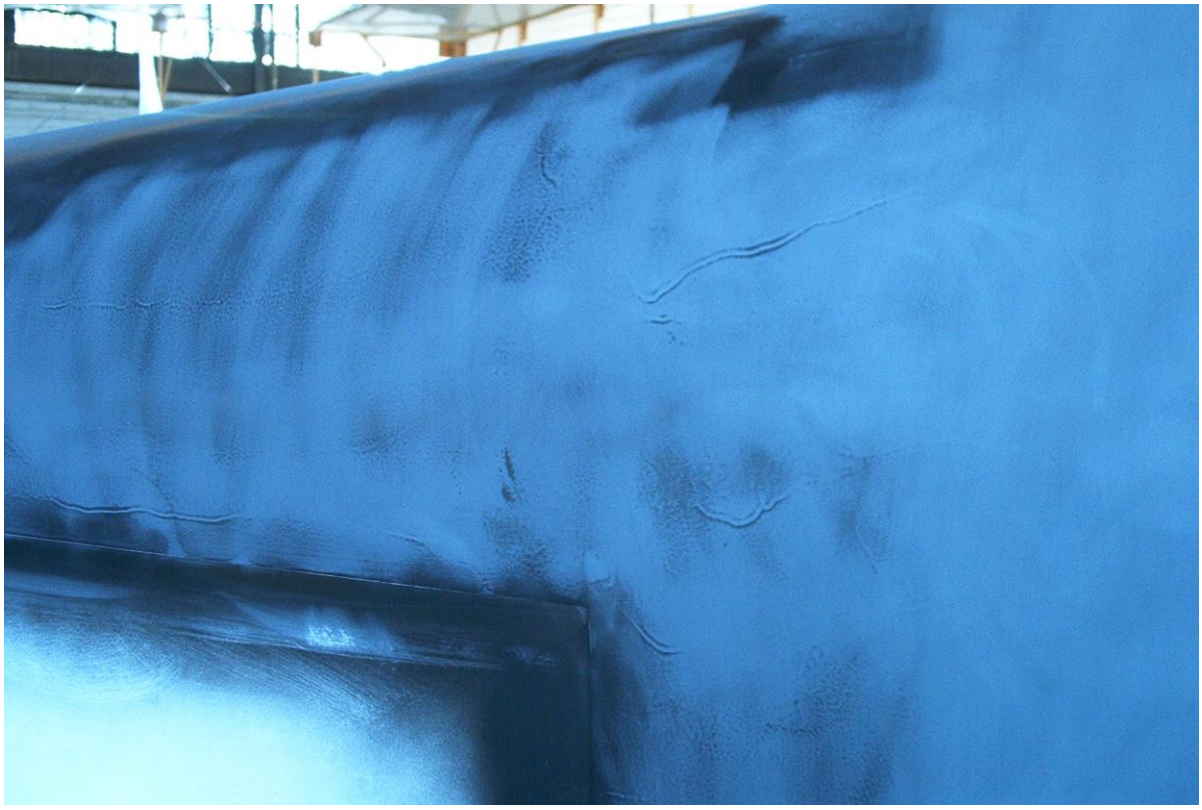


*Photo 9 – **Black UV Blocking Primer** has built-in "guide coat" for sanding. Shiny areas show low spots and runs become very obvious.*

on smooth areas and blemishes show up readily as still glossy. Car painters normally spray flat gray primer and then apply a coat of flat black spray can primer on top of the gray. When they sand the surface, low spots show up as flat black. This "cheater method" is called a guide coat. Our ***UV Blocking Primer*** have this designed into them…the remaining shiny areas show the low spots just like the "rattle can" flat black does for car painters. Our product, however, does not introduce cheap lacquer based paints into proper urethane primers…

Even though our chemicals are possibly the most flexible in the whole paint industry, they dry quickly and will sand like "old school" lacquer primers. Special thinners and sanding agents allow this great property. Our customers love the sandability of our ***UV Blocking Primers***.

Seven Temperature Range Thinner Choices

While I've mentioned thinner (or reducer), let me explain our thinner formulas. All our chemicals from ***UV Blocking Primers, Color Top Coats*** and even our ***Clear Top Coats*** use the same ***Universal Urethane Thinners***. This is rather unique to painting products, especially aviation chemicals. This means that there is little chance that the chemicals will react to each other, as happens with some coating products. It has always been obvious to me that part of the "popping of paint" that folks complain about is a result of different chemicals reacting to each other. Our chemicals are **ALL** from the same chemical family.

Our ***Universal Urethane Thinners*** come in seven different temperature ranges from 50° to 115° to allow the chemicals to flow out properly and have painters achieve the exact results they want. Typical aviation coatings will usually offer two temperature range thinners and then have blush retarders to slow the drying process even further. Body shops will normally have their own heat booths to help with this as required. All our chemicals are designed to be applied in true homebuilder's workshops and be air dried. A heated booth can be used, but it is not required.

The first coat of the ***Black UV Blocking Primers*** can be sanded in 5 to 10 minutes if our super fast drying ***Accelerated Thinner*** is used. Normally one does not need to sand that fast, but the option is there.

Please note that spray guns must be cleaned immediately with all our chemicals as they are designed to set up quickly to reduce dust and dirt from contaminating the paint. Remember most builders don't have perfect dust-free paint booths and our shop doesn't either. Our own paint shop until recent years was our dusty wooden propeller shop or

even outside! This is why I created this painting process. Who would ever think you could paint a $750,000 Lancair Propjet without a perfect dust-free paint booth and achieve a mirror finish?!?

Photo 10 – Lancair IV Propjet in typical low cost (plastic) homemade spray booth inside an old WWII hangar – finish shine is obvious.

Well, enough special chemical details for now. Let's go ahead and get ready to spray the initial coat.

Suit Up for Safety

When spraying any chemicals, we always recommend you use proper protection – skin, lung and eye protection. Good coveralls and gloves are standard for all painters. A proper charcoal cartridge type respirator is the minimum one should use when spraying paint. If you have access to a fresh air respirator, that is even better. Most painters in industry – industrial, automotive and aviation – prefer the ease of use of charcoal respirators. Fresh air has been a real hard sell to painters because they are expensive and somewhat cumbersome. The price has come down a lot in the last few years to under $500 for a unit with mask and hood. Charcoal respirators are legal in automotive spray booths using catalyzed urethane paints and this is what we use as a minimum ourselves. You should cover your head and even eyes. Many professionals do not wear eye protection, but they should. Goggles with tear-off plastic sheets are available.

Getting Ready to Spray

Applying the first spray coat of ***Black UV Blocking Primers*** is rather easy. For our thick ***Black*** or ***White UV Blocking Primers***, we use spray guns with tips sizes of 1.7 to 1.8. These are referred to generally as primer guns. Before spraying, blow off the part to be sprayed with clean compressed air. We use a clean latex glove on one hand as the air is applied from the blow nozzle with the other hand. The gloved hand aids in breaking dust particles away from the part surface. It simply cuts the surface tension and static and the application of air blows the particles away. Be careful to not get the air so close to the surface that it blows out the special ***Wonder-Fil***. Also, I do not use surface cleaner at this point because it also will remove the ***Wonder-Fil***. A tack rag can be used instead of the latex glove – most professional painters use the tack rag method.

The mixing ratio for our ***Black or White UV Blocking Primers*** is 4:1:1 – 4 parts ***Black or White UV Blocking Primers,*** 1 part ***Universal Urethane Thinner***, and 1 part ***UV Blocking Primers Catalyst.*** Two methods can be used to measure the mixing ratios. I use marked, graduated mixing cups for large parts. For small parts, I use small mixing ladles. The ladle method is really accurate and allows you to not waste chemicals. There is a short learning curve to figure amounts needed for various part sizes, but you can pick it up quickly.

The air pressure used to apply the ***UV Blocking Primers*** is 25 to 45 psi for HVLP and 45-60 psi for siphon feed guns. The more air used, the better liquid chemicals are "atomized" or busted up into fine particles. When you hear of "orange peel" painted surfaces, generally it starts out as air pressure being too low. Modern HVLP spray guns are notorious for this. Everyone has been told HVLP will greatly reduce overspray and they can, but overspray is finely atomized paint particles, which produces smoothly painted surfaces!

The 25 to 45 psi is at the incoming end of the gun and with the trigger pulled – not the gun at rest.

The next way that orange peel is reduced is with the thinner. Extra thinner is one way some folks get paints to flow out nicely, but you lose the ability to rapidly cover in as few coats as possible. Older style and cheaper paints use additional thinner in their products. Thick high build chemicals and pigments cost more money.

We prefer to change the temperature range of the ***Universal Urethane Thinners*** we add and this step changes how fast the paint will "flash off." The longer it takes to flash off, the more time the paint droplets will have to flow out evenly. Too much added thinner or too slow a flash rate thinner will help create runs. We have purposely created our ***Universal Urethane Thinner*** system to aid in giving a painter the best of all worlds.

Spraying primer is a great place to learn how to paint, so don't lose sleep over all the technical things I've thrown out so far. The ***Loehle System*** was set up for novice painters as well as pros. We've invested 40+ years to aid folks to learn to paint their own project and get the "wow" factor from their buddies!

I recommend that the first coat be applied by testing the spray gun on a clean piece of cardboard or masking paper taped to the wall. This is standard shop procedure for most painters.

I like the spray fan to be slightly under the widest fan pattern. Remember that when you narrow down the fan spray pattern, paint is being applied to a tighter area and runs can quickly show up. In primer especially, you just quickly sand them away. A few runs will actually help you fall in love with our chemicals' sanding properties---they sand well and all runs are visible immediately because of our flat vs. shiny built-in guide coat (see Photo 9). With a little practice you'll get the hang of it.

Spraying the First Coat of ***Black UV Blocking Primers***

After setting up your spray gun, spray one full coat of the ***Black UV Blocking Primer*** onto the part surface. Move the gun slow enough to completely cover as you go. Too fast and the paint will be thin. Go way too slow and, you guessed it …runs. Just a little practice and you'll see.

Some painters will want to apply two or more thinner coats instead of one thick one. That's ok and all our paints can be applied with many various techniques. What I'm trying to show you with the one coat method is the coverage and this allows you to get used to spraying. The ***Black UV Blocking Primer*** sprayed over a composite part easily shows you exactly where you've painted and where you've missed. The dark black is dramatic.

Allow the part to dry well before you start to sand it. This time can vary from 5 minutes to an hour or so depending on the temperature of your shop and which thinner you chose. Setting the part into direct sunlight will speed up the drying. Our ***Black UV Blocking Primers*** dry very fast compared to most paints anyway. When dry sanding, if the open coat white dry sandpaper gums up, the primer is still a little "too green."

Photo 11 – Smoothly sanded upper cabin area of RV-10.

Spray Gun Cleanup

I pour a small amount of thinner into the gun and cover up the top vent hole while I lightly shake the gun to clean the inside of the cup, by spraying the gun until only the thinner is being sprayed out the nozzle. (Note: This may be illegal for EPA reasons in some states.)

Be sure to clean your spray gun out completely. We use very "hot" lacquer thinner for this purpose. Do not use the more expensive ***Universal Urethane Thinner*** for this. The "hot" cleanup lacquer thinner is much cheaper and does a much better job. (Note: Just be sure to introduce the ***Universal Urethane Thinner*** back into your gun's system before spraying your next coat --- you don't want lacquer thinner to mix in with your next step or you'll possibly have a problem called "fisheye".

I personally use a plastic spray bottle to wash my gun down. The spray helps remove the thick paints quicker and less thinner is used. I wash and spray the gun parts over a plastic bowl to catch the thinner run-off.

I sand the part with dry 150 grit open coat sandpaper to see how many blemishes and pinholes are left. Van's parts will have a good bit. I use a 6" orbital "DA" sander normally, but the parts can be sanded by hand equally well – it's just slower. Remember to use a dust mask and think ahead about where all the sanding dust will go. A small bench outside is handy and keeps your spray area cleaner, and helps keep peace at home!

The blems will show up immediately and you'll fully understand why these chemicals were created. Missed pinholes can have more ***Wonder-Fil*** applied to them and large areas can have filler added to them. Epoxy fillers or polyester types are all ok. The epoxies will slow the process of filling and sanding down generally a whole day. I know there are lots of opinions about epoxy vs. polyesters and I won't try to convert you either way… I do know that from my experience the polyesters work well and are much faster to sand. Some argue that epoxies don't shrink and polyesters do. I do know that your Van's epoxy laminated cowlings will show little or no cloth weave on the surface when they are new. A year or so later, the epoxy will pull down and a slight cloth weave will be noticeable. Some RV builders will even leave their unprimed parts in the sun in an attempt to allow the shrinkage to minimize. Well, back to the fillers… I think they all shrink somewhat and polyester possibly more, but I don't see the use of epoxy type filler in the automobile field and even in the $200,000 to $300,000 street rods and custom motorcycles. I use mainly polyester fillers and might choose epoxies when working the glass work on top of an RV-10. This would primarily be for large fill areas. Small blems in wheel pants and cowling seem to be fine with polyester.

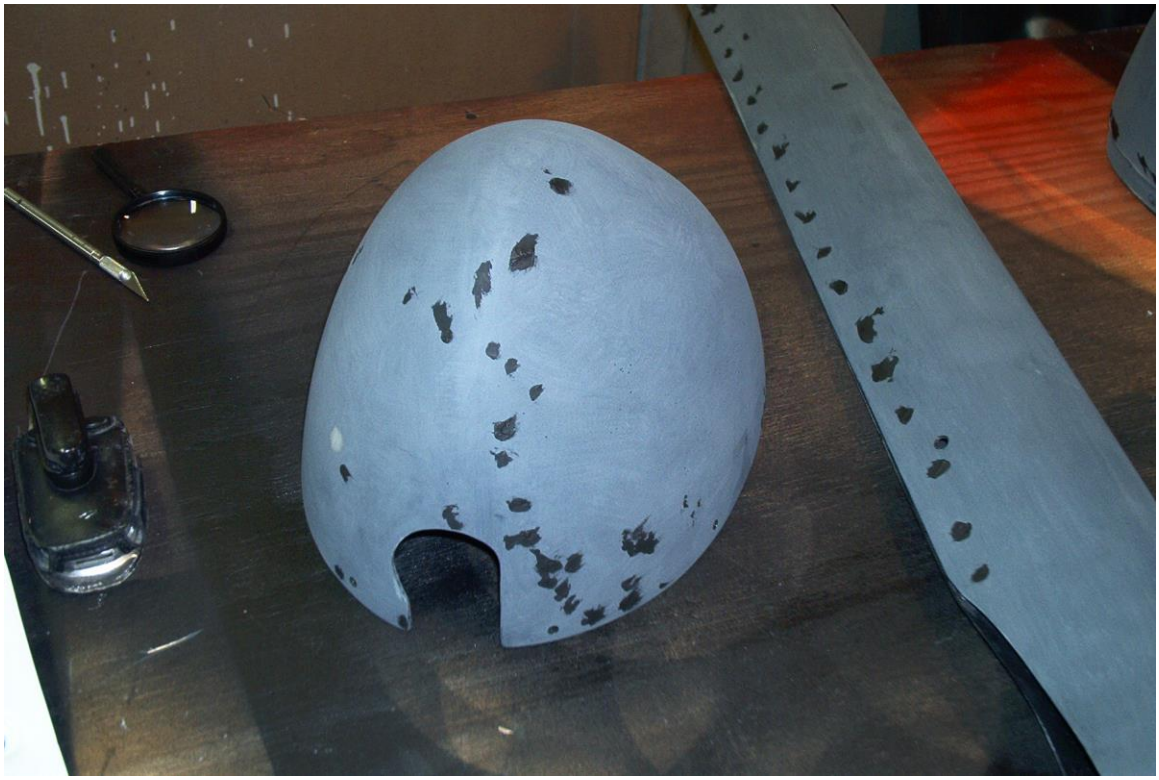


*Photo 12 – **Black UV Blocking Primer** mixed with microballoons to create a special paste to fill blemishes on front of wheel pant and strut fairings.*

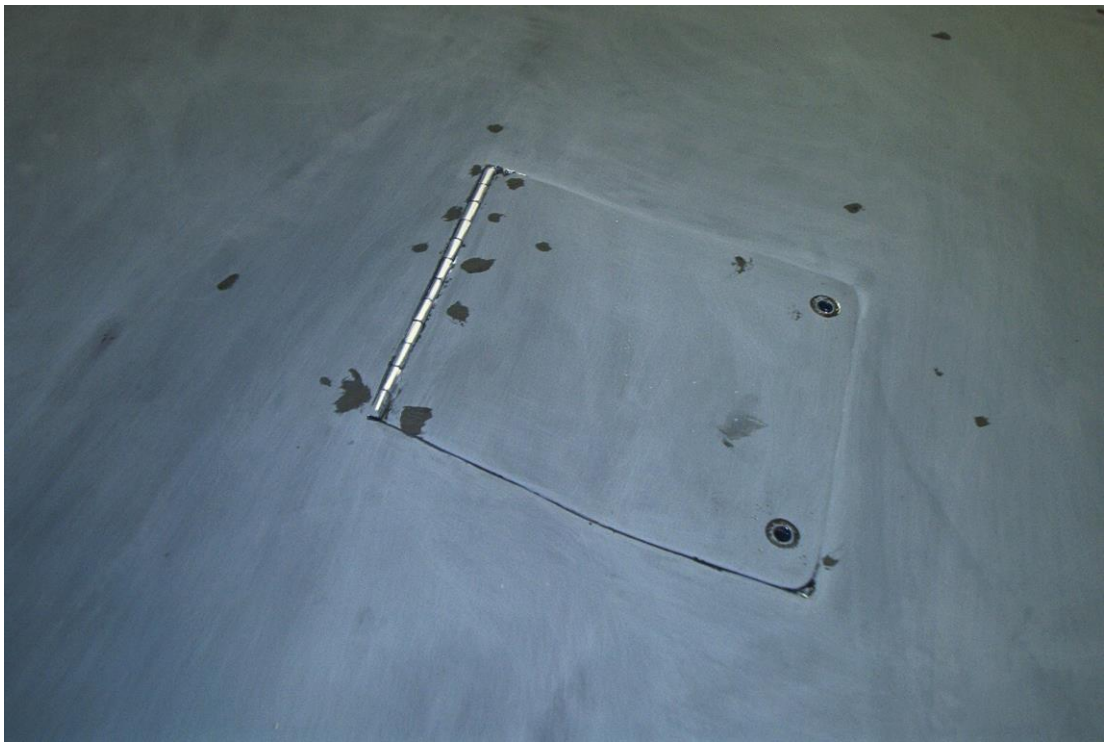


*Photo 13 – **Black UV Blocking Primer** microballoon paste to fill blemishes on oil access doors on cowling.*

Photo 14 – More microballoon filling.

We mix microballoons directly into our ***Black UV Blocking Primers*** and putty these into blemishes routinely. This eliminates any "foreign" fillers to the primed area. This will require a longer dry-to-sand time than a sprayed on chemical. Our Accelerated Thinner should be used to help speed up the drying process.

Once you have the blems filled, you can apply another ***Black UV Blocking Primer*** coat and repeat the process. I do not wipe the sanded part with ***Surface Cleaner*** before reapplying the next ***Black UV Blocking Primer*** coat unless the part has sat around a day or two or if friends have visited the shop…smooth sanded parts seem to attract oily fingers! Just wipe down the surface with ***Surface Cleaner*** then. Remember that you will remove any ***Wonder-Fil*** you've just applied if you do. Also proper technique for using surface cleaner is to use a lint free shop towel or virgin cotton rag. Wipe the surface, turning the rag until the surface of the part is dry. Do not leave the surface wet. The purpose is to have the cleaner move the dust and oil to the rag.

Also, I use only "known" surface cleaners, and ours is listed on our product list. Some recommend that anything that smells like Coleman fuel is ok---not for me. Enough problems arise when painting an aircraft without creating one with unknown chemicals.

One note on our ***Wonder-Fil***: We use it to fill open pinholes primarily. It will fill other areas, but our thick ***UV Blocking Primer*** really is what works best. Previously filled pinholes may be visible as the previously applied ***Black UV Blocking Primer*** will soak down into the hole and sometimes leaves a slight depression. The next ***Black UV Blocking Primers*** coat will level them out quickly. ***Wonder-Fil*** can be used at any step of painting—all the way through clear coat. Remember it turns whatever color you are spraying – even clear. You know it is mixing with the paint when you see it go from white to invisible!

Repeat the priming process until you have the totally smooth, flat looking sanded part. It doesn't get better than that.

Many builders that use automotive paints normally use flat looking gray primers and the surfaces will "look great" until shiny paint or clears are added. I do not use typical base coat/clear coat for similar reasons. The color base coat

can look perfect after it dries to a dull, flat look, but blemishes and runs can show up when the clear coating is applied. What I'm driving at is the initial priming steps never fully removed the blemishes, as flat gray finishes help hide them. Our shiny vs. flat sanded ***Black UV Blocking Primers*** let you work them out in the earliest stages of the painting process.

All of what I've written to this point may seem overwhelming, but it's not…anyone that wants to paint can paint. The details I covered for the initial ***Black UV Blocking Primers*** will apply to all the rest of the painting process. The basic fundamentals are the same – air pressures, dry times and mixing ratios can vary, but overall after your first smooth composite part you'll be on your way to being a painter!

Application of ***White Filler/UV Blocker***

Continuing on with the composite part described previously, the smoothly sanded part can now have the final priming coat of our ***White UV Blocking Primers*** applied. It is mixed the same way. Spray it on with our single coat method or several lighter coats…the goal is to cover the Black with White so color coats to follow will look top notch and vivid. Most bright colors will really jump out or "pop" when you apply them over a white base.

Photo 15 – ***White UV Blocking Primer*** *sprayed over smoothly sanded Black coats.*

*Photo 16 – **White UV Blocking Primer** applied to all metal wing of RV-10.*

Gray type primers can be harder to cover with some colors. Later "tiger stripes" may show up in varying light sources. Simply put, the darker gray may show up through the paints. Most aircraft are largely white, so we choose to use white pigments in our second stage ***White UV Blocking Primers***. Our competitors have picked up on this idea now too.

If your parts or even your plane is a dark color, you can simply use our ***Black UV Blocking Primer*** under the dark color coat. I lay down the ***White UV Blocking Primers*** all over before painting most colors.

After sanding the White with 400 grit dry sandpaper, the part is ready for color. If you want to wet sand as some do at this stage, that's perfectly fine, as you hopefully have all the areas sealed from water by now. 320 to 400 grit sandpaper is good for the wet sanding process.

A maroon or gray Scotchbrite type nylon pad is used right before color is applied to remove all shiny areas. This helps assure proper paint adhesion. I've done numerous test panels over the years without scuff sanding prior to the next coat of paint with very little peeling problems, but you should scuff any surface being painted. This applies to our paints or any other brands.

A note on this with other brands… I have a sneaking suspicion when one sees clear coating peeling off of cars and planes, it's because of the fact that the surface was not scuffed prior to clear application. Base coat/clear coats normally recommend that you <u>not</u> scuff them prior to clear coating and the results may be what we see way too often. Even base coat that has been previously applied several days or weeks before generally is said to need sanding and even repainting before adding on the clear coats. I know there are many opinions on the use of base coat/clear coats, but in 40+ years, peeling paint has never been a problem for me.

<u>Painting Metal Surfaces</u>

Now let me discuss the application of our ***UV Blocking Primers*** on metal parts of a Van's RV. Normally I apply only our White Filler/UV Blocker as there is not a need to use the Black. We're not trying to find composite blemishes or even block UV rays for this step…only apply the most flexible, high quality primer we can produce. One may question why we want flexible on the metal parts also. All materials will expand and contract with heat and metal can really expand. I first noticed the peeling of paint as a teenage line boy. The FBO I grew up at had 20+

Cessna 150s for rent and when you fuel that many planes of the same type, you can start to see first-hand where paint problems first start. The paint breakdown points I always remember were on top of the wings where the sheet metal panels were joined. The paint seemed to be so brittle in these areas that as the panels expanded and contracted slightly, the paint would split and then start to peel. The ***Loehle Ultra-Flex Technology*** is designed to delay the effects of the paint drying and becoming brittle. All paints eventually seem to become more brittle as a lot of time passes, but with proper flexible additives the paints last longer (which, of course, it the goal).

Photo 17 – ***Black UV Blocking Primer*** *used to achieve smooth blends of composite areas to metal area.*

Areas on RV's that blend composite parts to metal (such as mentioned previously on the RV-10) will have ***Black UV Blocking Primer*** used in those areas. They will then be coated with ***White UV Blocking Primer*** to blend into the ***White UV Blocking Primer*** used on all the sheet metal surfaces. Remember, the Black just helps you make glass areas completely smooth by showing you the blemishes. The White has the same finishing and sanding and shiny vs. flat properties…it's just much easier to see how to do the work in the Black color.

<u>Aluminum Prep – Clean and Sand First</u>

Well, before you apply any ***Black or White UV Blocking Primer*** to the sheet metal, you will need to prep the aluminum, as most Van's builders know. I think entire internet band width has been used up on this subject over the years! I won't get into all the varied options, I'll just tell you how we do it. Our methods utilize two processes. The first is the industry standard one of aluminum etching followed by using Alodine. The second method is the use of Pre-Kote. Both methods are great in my book, but I prefer Pre-Kote because it seems to be easier and is environmentally friendly.

To start with, you will need to thoroughly scrub the surface you are working on with an alkaline detergent (such as Dawn).

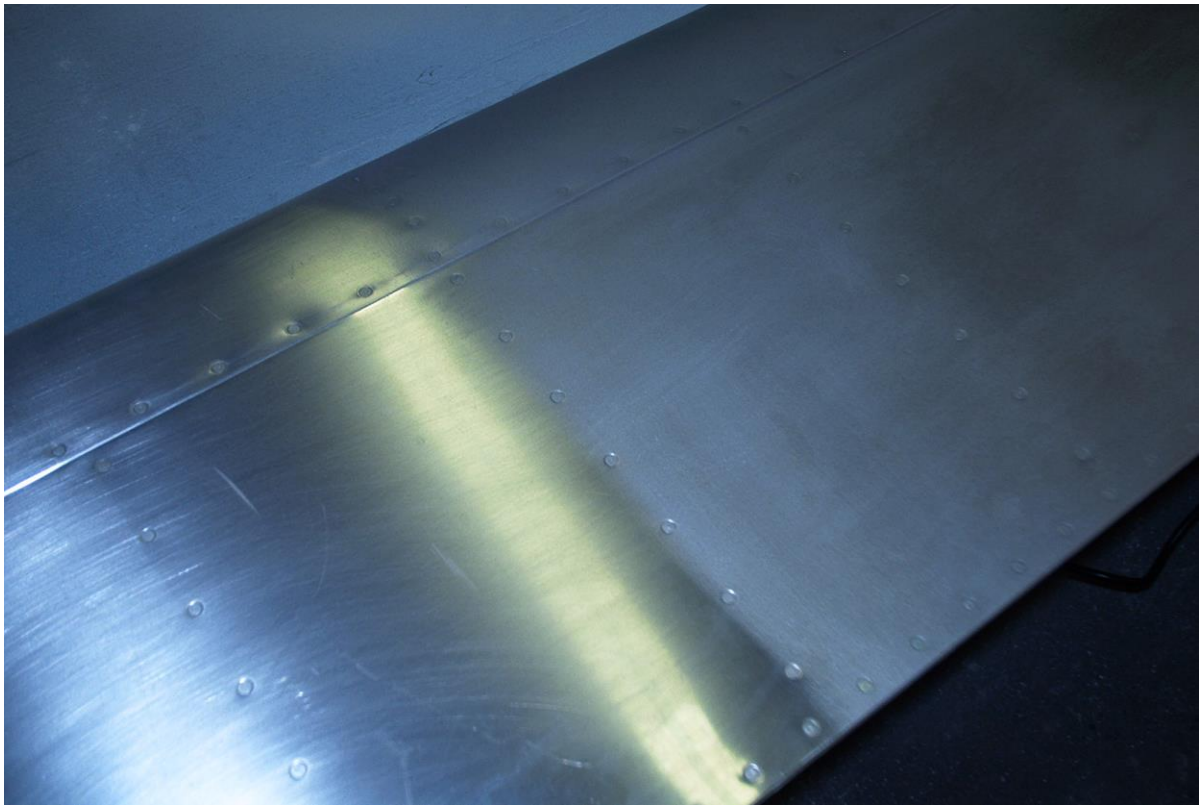


Photo 18 – Metal surfaces need to be properly scuff sanded. Right side shows 400 grit sanding and left side shows the initial use of an abrasive pad.

Abrasive pads should be used with the detergent to assure the surface is completely clean. This will also scuff the surface and allow future chemicals to work properly. All surface areas need to be scuffed with these abrasive pads. Rinse with fresh water the whole time you are cleaning the surface. Do not allow the detergent to dry on the surface.

If you have rough areas, they can be sanded lightly with 220 to 400 grit sandpaper. Areas on an RV that require some of this is some slight protruding rivet heads. One must naturally use common sense and not sand away a bunch of metal thickness or generally even remove the Alclad (pure aluminum) layer on the metal. 220 grit sandpaper is about as coarse as we would ever go. 400 grit is best. Wet sanding works great here.

The shiny surface of sheet metal will need to be scuffed or your paint is probably not going to stay on very long…not to mention that the metal prep treatment will not work. The rule of thumb is if water beads up on the surface of the metal, it's not ready for metal treatment or paint. My favorite tool to accomplish this is the red/maroon Scotchbrite hand pad. This is usually done with a lot of elbow grease with soap and water. Scotchbrite pads for use on an air operated "DA" are also available. These are my choice when scuffing large areas thoroughly. This will be faster and will help you and me to still have elbows in our later years! Round pads can be cut to fit the orbital (DA) sanders.

Some builders will use square electric sanders with Scotchbrite pads on them. The surface area where you are working is best kept wet during the process. One needs to keep this in mind if you elect to use any sander that is not air operated. Be very careful with electric sanders of any type around water. Use common sense. The surfaces should be thoroughly cleaned and rinsed with clean, hot water (if possible). We do not risk using these with water.

<u>Aluminum Etching - Application</u>

People complain about having to spend the time to properly treat aluminum. Compared to the entire process of building and/or painting an aircraft, the actual work is rather trivial compared to the overall picture. The effort will always be worth it in the years to come…and the paint that will be applied will have a better chance of bonding and not popping off or peeling in the future. Nice looking paint will be what sells a used RV and not the outdated panel!

We would never consider not properly treating the surfaces of an all sheet metal aircraft. As stated previously, the metal surfaces are structural and all practical steps should be taken to prevent corrosion, and etching and Alodine or Pre-Kote are currently the industry standards for individuals to accomplish this.

After the entire surface is thoroughly scuffed and cleaned, the surface needs to have a chemical etching process applied to it. Our ***Aluminum Etch*** is the chemical to be used with our ***Loehle Coatings***. The chemical is diluted with water before it is applied. For heavily oxidized areas, mix the Aluminum Etch with a 1:2 ratio…one part chemical and two parts water. For lightly oxidized and other surface areas, use the Aluminum Etch in a 1:4 ratio…one part chemical and four parts water. Do not mix the solution in a metal container. Mix and store the chemical in a plastic container only. Also do not use the solution below 60° F.

The ***Aluminum Etch*** is a phosphoric acid based cleaner and brightener, so one will need to protect any areas that are not to be treated with plastic (polyethylene) sheeting and masking tape. Any seams in the sheet metal that might have excess chemical solution "wick" or enter into them and not easily rinsed, should be taped up while one is working with large amounts of the etching solution. The areas that one elects to tape up with masking tape can then be treated as a localized area. This is normally not a real problem if one uses common sense around seams. Most seams that allow the etching solution to enter can also be rinsed out right after, if one pays attention. The solution must be rinsed off before it dries.

The procedure for applying the solution of ***Aluminum Etch*** or Pre-Kote is rather simple, but must be done correctly.

Photo 19 – Scuffing surfaces with abrasive pad. This is typical of initial scrubbing with detergent and when applying ***Aluminum Etch****, Alodine or Pre-Kote. The surface* **MUST NOT** *bead up water or it's not scuff sanded enough.*

Apply the diluted solution with a brush, abrasive pad or sponge. Wear rubber gloves, protective clothing and eye protection. Keep the surface wet with the solution for 2 to 3 minutes and then rinse the solution off with clean water. If the solution is allowed to dry on the surface, one must reapply the solution and repeat the 2 to 3 minute period and rinse it off while it is wet. The most common reason one has to repeat the process is that one tries to work too large of an area and accidentally allows the solution to dry.

The surface must have been scuffed previously with the abrasive pad to allow the ***Aluminum Etch*** or Pre-Kote solution to remain wet on the surface for the 2 to 3 minutes. The solution should not bead up on the surface, or the scuffing procedure was not done properly. The solution must lay like a sheet (film) over the entire surface one is working or the etching process will not work properly.

Some individuals advise that you can scuff up the surface to begin with while you are etching the aluminum. We feel that it is best to actually scuff up the surface while you are cleaning it with the detergent and abrasive pad. If you

leave the scuffing to be accomplished at the same time you are etching the surface, one would think that you would be weakening or at least contaminating the etching solution…

While the ***Aluminum Etch*** solution is still wet, rinse it off with clean water. The water should not bead up or the surface was once again not scuffed properly. If you did miss an area, it will probably show up here again. None of this process is complicated, but you need to work areas small enough to prevent drying of the etching solution.

If you want to stop here with the process, the surface needs to be dried completely with filtered, high pressure, compressed air. Blow out any and all seams very well.

Alodine Treatment

We first used an Alodine treatment way back in 1977. The process has not really changed since then. The process is very similar to metal etching. It is not any harder than the previous process. It is well worth the effort and we prefer to use Alodine that colors the aluminum a golden (amber) color. The color really helps you know you have the areas properly treated.

The ***Alodine*** is not diluted, but applied full strength. If you elect to apply ***Alodine***, you should apply it while the surface is still wet…right after the ***Aluminum Etch*** process is best. You could apply it up to 4 hours after the ***Aluminum Etch***, but again, right after is best.

Apply the Alodine with a brush, abrasive pad or sponge. Wear rubber gloves, protective clothing and eye protection. Keep the surface wet with the solution for at least 3 minutes or the time specified by the manufacturer. Then rinse the solution off with clean water. You should see a nice, uniform golden color. Some aluminum will not show the yellow cast very much. Blow everything dry as stated previously with compressed air.

The structure is now ready for the application of ***White UV Blocking Primer***. Handle the surface as carefully as possible and try not to get oily fingerprints, etc., on the treated surfaces.

We like to apply the surface primer as soon as possible. The same day is best.

Pre-Kote works similarly…but is a one-step process instead of a two-step. This newer method is approved by several airlines and military applications and is easier to use.
I personally use Pre-Kote *instead of* ***Aluminum Etch*** *and* ***Alodine*** *now…*

Steel Parts

Most aircraft have some steel parts on them and we use a ***Steel Etch*** solution for these. We can also supply special etching primers and/or epoxies to go under our ***UV Blocking Primers*** if customers want. Urethane surfacers (primers) are replacing zinc and epoxy coatings throughout industry, but the aviation community is sometimes slow to accept changes.

Most Van's parts are new and rust-free so we use a simpler method for these. I generally will sand the part as required and if bare metal is showing, I will simply apply a light coat of zinc chromate to the exposed areas. Zinc rich etching primer also works well followed up with our ***White UV Blocking Primer***. With light sanding with 320 to 400 grit sandpaper and you're ready to apply our flexible Color Top Coats.

Applying Color

I will generally sand the ***White UV Blocking Primer*** lightly with 400 grit sandpaper and follow it up with a maroon or gray Scotchbrite type pad to remove shiny areas. This light scuffing allows you to do a final inspection of areas before you go to the color stage. Any problems can be sanded and that particular area re-primed with White as needed. There is no reason to apply a new full coat of ***White UV Blocking Primer*** over the entire "good" surface areas. Simply lightly sand to blend the touch-up area into the other area and you're ready for color.

Our ***Color Top Coat*** is then applied over the sanded ***White UV Blocking Primer***. The color choices we can provide are almost unlimited. Our standard colors are simply matches of the well known colors that have been used in

aviation for years. Special colors, such as metallics and pearls are available. The easiest way for us to provide them presently is to have folks supply us with a chip of color they like or a paint number from another brand of paint. We can supply virtually any modern colors – even the hot ones on street rods, etc. All our ***Color Top Coats*** are fuel and chemical resistant.

I use an HVLP spray gun with a 1.4 to 1.5 size tip for spraying on our ***Color Top Coats***. The mixing ratio is 4:1:2:1. This is 4 parts ***Color Top Coat***, 1 part ***Color Top Coat Catalyst***, 2 parts ***Universal Urethane Thinner*** and 1/2 part ***Flexible Additive***. The air supply is 25 to 45 psi for HVLP and 45-60 psi for siphon feed guns.

Our ***Black and White UV Blocking Primers*** and our ***Clear Top Coats*** do not require the addition of ***Flexible Additive*** to them, as it is already factory mixed in for you. The Color, however, requires the flex to be added when it is time to spray. The almost unlimited colors we can supply would become very limited, if we tried to pre-package the flex into them. The reason is colors are mixed using gram scales and various toners to achieve the colors, metallics and pearls. The formulas are pretty much available to us worldwide to achieve the exact color in our paint, but we have to rely on industry standards to offer the vast selection. The weight of our Flexible Additive would destroy all the present gram scale formulas and mixing ratios. I hope that's not too confusing and I normally don't even try to explain it to kit builders…but I realize Van's builders want to know and understand the fine details.

The spraying technique is different for applying the ***Color Top Coat***. Colors, ours included, are thinner than surface primers. They will run easier, so we apply them more like "older type" chemicals…we spray on a "tack coat" and allow it to tack up. This means we want it to be able to be touched lightly without getting onto one's finger. This can be checked by touching an area that has been masked up. This tack coat is essential when spraying metallics, as the flakes will move around, if you don't use tack coats. Also, a good tack coat will help prevent paint from bleeding under masking tape. This is especially helpful when you apply additional trim stripes, flames, and other type artwork.

I like to follow up the tack coat with a single heavier coat in the opposite direction. I prefer to allow this coat to flash off somewhat before I apply a third coat. Some colors get by with a tack coat and a single full wet coat…others require more. Some metallics are best put on with many lighter coats. Our customers that have shot numerous brands of paint say we generally cover better than ones they've used before. One 25+ year commercial painter told me my mix was the only gray he ever applied in one wet coat! We use some of the best pigments available and don't water (thin) them down like some economy type paints. The ingredients in paints are a worldwide commodity and generally, if they're cheaper, there's a reason. We specify only the best we can get for our paints. A car may be painted and be sold to a new owner in a year or two….before the paint breaks down. Our paints may be on an airplane that may stay in one's family for 25+ years. That's my goal for ***Loehle Coatings***.

*Photo 20 – RV-10 flap with **White Color Top Coat** applied over **White UV Blocking Primer**.*

The ***Color Top Coat*** will take longer to dry compared to our ***UV Blocking Primers*** and ***Clear Top Coats***. One should try to keep down dust, etc., as best as possible during this process. We do provide customers with faster thinners for special circumstances, but we generally apply our colors and wait until the next day to sand or scuff them. Some folks like the quicker drying feature of base coats, but I find they are nowhere near as durable as our catalyzed ***Color Top Coats***. **Adhesion, longevity, durability and shine is what our paints are all about.**

When applying additional trim colors to a previously painted color, you really want the paint dry enough to scuff sand and not leave tape marks. Most of the time the next day is fine. Also, tape marks will disappear by lightly sanding before clear coating.

One note, our colors can be applied and will dry so shiny that I have trouble convincing some builders to apply the clear coat. Some say they are amazed at the shine. I say wait until you see the clear! And the ***Clear Top Coat*** protects all your work!!

Since our colors are rather durable, it is rather easy to sand out dust or other blemishes prior to clear coating. We even have a cool tool that will shave off runs…and you guessed it—we call it a Run Shaver. We're always trying to make the job easier, faster and more user friendly.

I lightly sand the shine off of our ***Color Top Coat*** to get it well prepped for the final ***Clear Top Coat***. I will wet or dry sand lightly and follow it up with a gray Scotchbrite pad. I am particularly easy with wet sanding, especially on the very edges of sheet metal joints. It's easy to remove edges on RV wings when sanding them. I will normally use the nylon pad to do this. If the surfaces do not need any sanding, I just move on to applying the ***Clear Top Coat***. Sanding/Scuffing is not required for freshly painted items.

If something is accidentally sanded down to ***White UV Blocking Primer***, I use a touch-up air brush to lightly blend in the ***Color Top Coat***. It works well and the paint droplets are usually rather fine. Sometimes the brand of airbrush will require the use of more thinner and numerous coats to blend the color exactly. It's easy though.

Photo 21 – Blue plastic finishing tape applied to windshield for perfect paint line. Good quality paper tape is butted next to the plastic tape.

Let me discuss the use of masking tapes also. I am a firm believer in using only modern plastic masking tapes. I use either blue or light green fine line plastic tapes. Good quality paper tapes are also used to butt up against plastic tapes.

Photo 22 – Masking tapes and high quality "no bleed" (coated) masking papers make the paint job nearly perfect.

Modern urethane paints will generally take longer to flash off or dry than old lacquer type paints or base coats. They will creep under most paper tapes – even the best (expensive) brands. The plastic tapes were designed for this purpose. They will normally pull off rather cleanly after the paint is dry. I do not pull tapes while things are still wet…some painters do, but I seem to always get little paint strings or hairs or cobwebs everywhere when I try it.

I take my time when pulling off masking tapes and even have a pointed Exacto razor blade in one hand in case I run into excess paint buildup over a tape edge. It's amazing that the paint can become so strong…starts to become like the actual tape with thickness buildup.

I will lightly sand the edges of trim stripes with 400 to 600 grit sandpaper to remove the slightly raised edges left by the use of masking tapes. The thin light green type plastic tape is not as thick as the blue type, but one must be careful using it, as it will stretch easily. When it stretches, it will narrow down and mess up good straight paint lines. The thin green is used for things like flames, and such on street rod and motorcycles. Most airplane painting like an RV is best with the more durable, thicker blue tape. My hat is always off to the pros that do flames and airbrush work… real artists.

Once all is painted in color and scuff sanded as needed, the final ***Clear Top Coat*** is next.

Clear Top Coat

If you don't even apply ***Clear Top Coat*** to our colors, they are still durable, shiny and chemical resistant. I highly recommend using the ***Clear Top Coat*** over all color applications. I designed my method of clear top coating back in 1988 to be applied over vinyl graphics (decals) and to seal in colored paints.

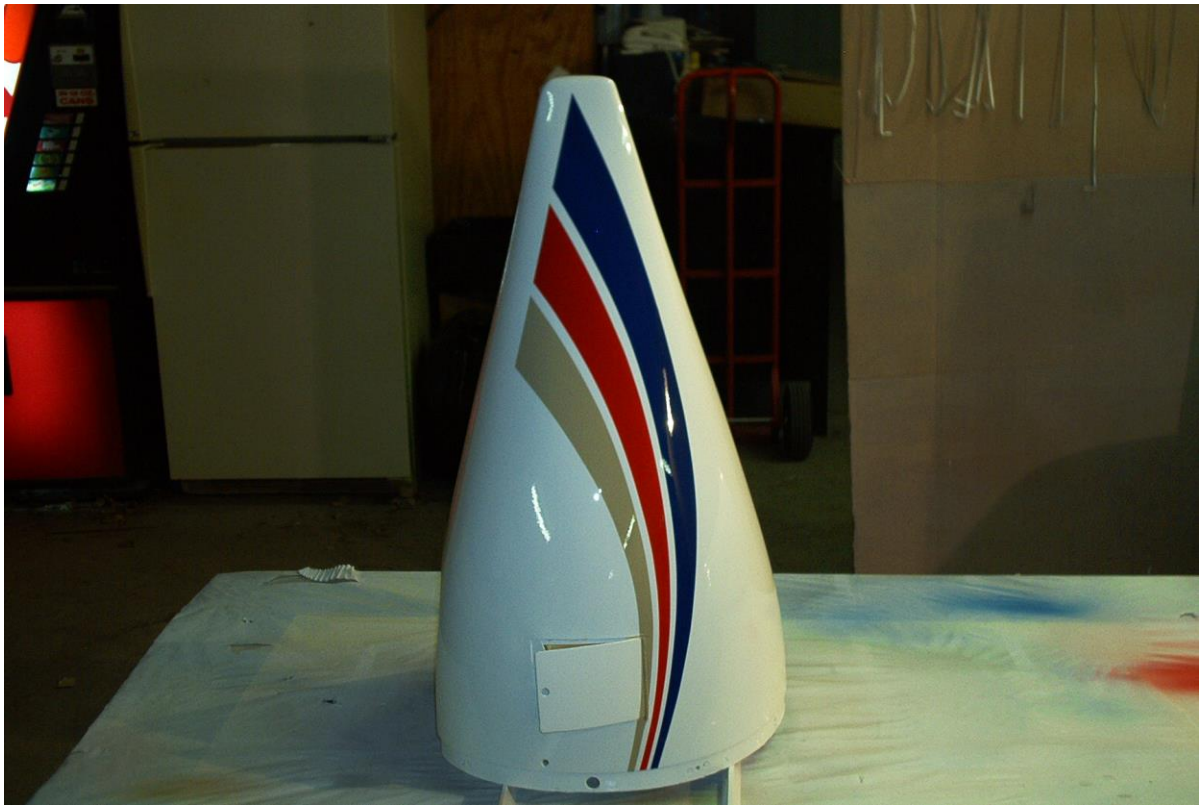


*Photo 23 – All labor intensive painted trim work is sealed in a protective **Clear Top Coat**.*

My clear coat experience on vinyl graphics was early enough that the vinyl companies said do not even try to apply clear over them. Well, it worked great and it's pretty well industry standard now!

The ***Clear Top Coat*** is formulated to be applied in as few coats as possible. I actually refused to consider bringing my paint system to the consumer market in the early days. The clears that I could get were thin and would run very easily. It used to make even me frustrated when all looked good, then a huge run would show up. My clear is

formulated to be flexible. It is also designed to flash faster than usual, so that dirt and bugs will be less apt to be trapped. The "flowing out" and "flash" times are adjusted by using one of our three temperature ranged catalysts. Our ***Clear Top Coat*** is formulated to be the easiest to apply for both novices and pros.

*Photo 24 – High gloss <u>unpolished</u> shine of **Clear Top Coat** applied to upper RV-10 cowling.*

Some typical clear coats will stay tacky for a very long time before they "flash off" and become dust free. If you have a dust free paint booth that you can close up and walk away from, a slow setting clear is ok. This type of clear can easily run off onto the floor when too much is applied by us novice painters…. myself included.

I use an HVLP spray gun with a 1.4 to 1.5 size tip for spraying on our ***Clear Top Coats***. The mixing ratio is 4:1. This is 4 parts ***Clear Top Coat***, 1 part ***Clear Top Coat Catalyst***. The air supply is 25 to 45 psi for HVLP and 45-60 psi for siphon feed guns.

A little practice and you'll be an expert with our ***Clear Top Coat***. Any dirt, dust, runs and even orange peel can be removed simply by sanding and buffing with various grades of sandpaper and polishing compounds. It's pretty easy to do with our clear coatings, but once you see how well it works, you'll probably want your whole RV buffed!

<u>Buffing, If Desired</u>

I'll quickly mention the buffing/polishing process and can go into extra details for folks later if requested. I like to sand our ***Clear Top Coat*** first with 800 grit sandpaper. It works ok dry sanded, but eventually small dust buildups form on the paper and cause scratches … not all that great. Wet sanding is better.

You must have adequate thickness of ***Clear Top Coat*** to utilize the machine method I am about to describe. If you choose to sand and buff large parts or the whole aircraft to remove dust particles and/or orange peel, we recommend using a 6" orbital air sander and begin with 800 grit wet sanding disc paper. Begin slowly and learn the simple process on a small area. You must keep the disc wet with water using a spray bottle.

Next, we use 1000 grit, followed by 1500 grit. A special 3000 grit foam back pad finishes up the sanding process. This leaves the surface semi-gloss.

The final step is to use a 3M cutting compound on an electrical orbital buffer. I use a yellow foam pad as of this writing. I wet the pad with water and apply some cutting compound on the outer edges of the pad. This too comes with a little practice. Again, work a small area while you learn. I am never afraid to buff the clear until it warms up.

Some folks allow only the cutting compound to remove the fine 3000 grit sanding marks. I have learned to allow the heat of the pad and the cutting compound to do the work and it becomes a “magic” finish. The clear will actually slightly soften and turn to mirror like glass. It's pretty amazing!

Photo 25 – Final buffing of Lancair IV Propjet fuselage…shiny curves galore!

I had decided early on that I only wanted the best clear coat that chemists could produce for final buffing/polishing, even though most airplanes are not buffed. I tried to make it good enough for the "very picky" street rod folks, and knew if I did that, I would have the very best for aircraft.

A good quality wax can be applied after the paint cures out. I've tried a good many products and methods to date and I've even been able to show some body shop folks some new methods…and they buff almost daily.

Saving Money

The last item I want to touch on is the "saving of money" in finishing an aircraft. I have heard builders say for years that they really don't care how the plane looks, they just want it airworthy. This is a mistake in simple attitude. The truth is they would like a nice looking plane, but are either not sure how to do it or they want to save money here at the end of their project. What they will see every time they walk into their hangar is a rough looking or dull finished

airplane. Other pilots will also express their opinions openly and it will start to hurt one's pride. And the honest truth is, if the finish is poor, people will also wonder about the rest of the workmanship.

The complaints I hear often when professional shops do the painting is that the cost was reasonable, but the customer spent additional weeks removing slight overspray and runs. Saving money becomes relative at this point. I have also seen professional shops offer low rates only to skimp on surface prep and the amount of primer and paint used on RVs. This leads to paint popping off numerous rivet heads, etc.

Most pilots' airplane is really their "pride and joy". Why would you want to skip on the finish? If this were your car or boat, would you paint it with house paint or any other cheap paint? I doubt it. If you really want to save money, just don't put in the "latest electronic gizmo" that will be outdated long before you're tired of your plane. Also, if you go to sell your plane, shiny ones sell quickly and for more money. Enough said…

Conclusion

Well readers, I could probably go on forever on my passion for my chemicals and why the whole process was created. I've tried not to make this a sales pitch at all and I truly hope you enjoy the tips and pointers shared in this article.

I'll invite you to try our system for yourself. I'm sure you'll see what it can do for you on your own RV. The complaint I've heard the most from our customers is why didn't we offer it for their previous plane?! I couldn't ask for a better complaint!

If you want the shiniest, wettest-looking, most up-to-date system on the market today, with our Loehle Ultra-Flex technology, try our process first hand. Just visit our website store, email us or call and we will help you with your questions, a free quote for materials or complete painting kit. You will be amazed how beautiful our paint system will make your aircraft look, when it arrives at the airport!!