

Hello Fellow Flyers:

The active building season is here. That probably means that at some point in the near future - - perhaps even tonight - - you will be gathering up your sealing iron, heat gun, and favorite film covering and facing the task of covering your latest Whiz Bang 60.

Most of us struggle to do at least a decent job of covering, wishing all through it that we could do a better job. Also, many, if not most, of you have seen demonstrations and read how-to articles that try to explain how, with lots of practice, you, too, can produce a beautiful, film-covered plane.

I have presumed that you might be interested in what I consider one of the best covering articles I have read and have attached the whole article for your reading pleasure and edification.

If you have had enough of how-to articles on this subject, then you, obviously, ignore the attachment and delete this whole message. But, before you do that, let me tell you that the article contains an interesting suggestion about how to practically avoid the dreaded and almost inevitable bubbling and lifting on solid surfaces. Imagine, sheet stabs, elevators, rudders and ailerons with no bubbles! Or, better yet, how about no bubbles on the fibreglassed center section of your wing. If that intrigues you, then read on.

After a lengthy discussion of traditional methods of covering the various bits and pieces of your airplane, the article describes an alternate method that greatly increases the strength of your plane and minimizes the possibility of bubbles. It involves pre-covering with silkspan (remember that stuff from a previous life?). The silkspan - - which is painted with only two coats of thinned dope and/or thinned Sticksit or Balsarite - - serves as a substrate that absorbs the gas created by heating the adhesive.

I hope that you find the attached article at least interesting.

- Peter Hess

The following article was written by John Miller and was posted to the Stuka Stunt Control Line Forum at <http://www.clstunt.com>. The article as originally posted, plus comments, may be viewed at here:
<http://www.clstunt.com/htdocs/dcforum/DCForumID1/6716.html>

Covering with plastic film, or my approaches to \$kote.

The question was recently asked, here on the forum, about a step by step approach to film covering. Since there are many ways that will work with film covering, I thought that I'd offer a few that work well for me.

Why Plastic film covering may be for you?

First, let's explore why you might want to use a plastic film rather than the traditional Silkspan, Polyspan, dope, or painted finishes. Let me say right up front, that a well executed "Kote" job can really look good, but they usually will not match up to a well done traditional finish. Still, you can expect to get decent appearance points, without all the fuss, and time invested in a painted finish. Plastic films can be a long lasting, serviceable finish with proper application and care. I use them often because I live in an Apt. My neighbors appreciate having less dope smell wafting through the complex, and not having to listen to a compressor.

Another possible advantage is a well done film finish will often weigh less than a painted finish. It will also often take less time, which allows you to be out flying, trimming, and practicing, while the other guys are still painting their planes.

Tools required.

Might I first suggest that anyone new to plastic film covering, get the excellent book on the subject by Higley. Becoming familiar with the techniques as discussed in this book will form a good basis for what I'm going to have to say on the subject. A little study with a book such as this will shorten your learning curve.

I'd also suggest, that if you are absolutely new to film coverings, that you try the various techniques on scrap pieces, and built ups that simulate specific problem areas we'll be discussing.

The bare minimum tools required, won't set you back as much as it would if you were trying to do a good paint job. I would suggest the following to get started.

A 100 pack of single edge razor blades.

An exacto knife.

A bulk pack of no. 11 blades for the Exacto.

A covering iron.

A covering heat gun.

Several pieces of poster board. (used under the covering when cutting.)

A can of Balsarite, or Sigs "Sticksit".

A foam brush to apply the Balsarite.

A good light source. (It's always easier when you can see what you are doing.)

Several straight edges, in different lengths.

Additional, or optional items that will make it easier to do a superior job.

An extra iron with a covering sock.

A small trim iron.

A trimming tool.

A self healing cutting mat.

Friskit "rotary" cutters, straight and pinked.

A good pair of scissors.

A smoothing glove.

Several pieces of foam or a couple of blankets to lay on the table to protect the plane and your prep work from damage while you are working on covering it.

Which plastic film covering?

Let's look at the available film coverings for a moment. There are a lot of choices out there, but I would suggest that you only consider the top of the line coverings. Your job will look better, and last longer by using the best. Some of the low temp shrink films will look good for a while, but my experiences show that there's often a delamination that occurs between the clear plastic, and the color/glue over time. Money spent on the best films available, will be money well spent.

My own films of choice are, MonoKote, Coverite Mica Film, and Oracover, or it's successor Ultrakote. These films seem to be much stronger, and longer lasting than the "Econo" brands. Of course, if you're covering a plane that will be used in any kind of sport, combat, or other events where appearance isn't as important as PA, go ahead and save some bucks if you want.

Covering a stunt ship is different.

Most CL stunter film coverings are limited to the flying surfaces, with the fuse painted. This is a good compromise for PA. A bit of attention to the wing/stab/fuse joints will make the change almost seamless. It's also possible to completely cover profiles and full fuse ships with a film. I'll try and cover the methods for both.

Preparation.

In any method of finishing, preparation is always the key to a good finish. Film covering is no exception. Proper sanding of the base is essential. Sand as if you were planning to do a traditional covering. Be sure to use a tack rag prior to apply any covering. Small imperfections will show like a boulder under a film covering. Remember, the covering is the final finish. You won't be able to sand out any imperfections while you are applying the finish as you can with paint.

Straight, or traditional film covering.

The traditional film method, would have you apply the film right over the prepped bare wood. This will work, and give a decent workable finish in most cases, but later I'll outline a better, in my opinion, method. One of the problems with this

method, helped a bit by the use of Balsarite, is the tendency for the film to "bag up", or get wrinkles, when exposed to a heat source, like the sun. Over time, this can make a film covering look pretty bad. Constant attention, and re-shrinking, can help, but often the heat used will cause more problems later, in the form of gassing under the covering, which causes the film to become loosened from the wood. A small pin hole at the edges can let the gas out as you stick the covering down should this happen to you.

I always apply Balsarite and let it dry before applying any film. It's just that added insurance for me. One, or two coats applied with a foam brush will be what's needed. After the Balsarite has dried, another light sanding and tacking will be helpful.

Balsarite, or Sigs equivalent product, Sticksit, should be definitely applied in the nose area to help prevent oil seepage under the covering.

Covering the flight surfaces before or after they are attached to the fuse.

Some prefer to cover the wing and stab before attaching them to the fuse. The most important consideration, if this is your choice, is to carefully mark and leave the covering off in the areas to be glued.

Some who go this route, prefer to cover from tip to tip, and then make, diamond cutouts, in the area where the glue will be applied. There seems to be some merit to this idea, as the additional strength imparted by the covering continues through the fuselage. The diamond cutouts allow the glue to attach to bare wood rather than the plastic film and its' bond to the wood, which, in most cases, is not as good as a wood to wood glue joint.

It can be said that the strength imparted from plastic films isn't that essential. Those who feel this way often cover after joining the flying surfaces to the fuse. This is my preferred method, even though I do believe there is some strength added by the covering.

Fuselage / wing / stab joint.

If you're planning on covering the entire plane with plastic film, and your fillets are either nonexistent, or very small, you should first address the important joint where the fuse and wing/stab meet. A bit of attention here will pay important benefits in the future.

If you are using small fillets, use your favorite method to apply them. With no fillets, the job may be a bit easier.

After applying and lightly sanding Balsarite, cut a strip of film long enough to go from the leading edge to the trailing edge, with some to spare, and wide enough

to extend at least 1/4" out onto the wing, and up on the fuselage. Start on the bottom. Starting at the bottom surface will hide your beginning efforts, should you make an error. Starting on the bottom also puts the all important lap joint slightly on the underside of the surface, where it's not as noticeable.

In the case of no fillets, crease the film lengthwise. Start at the high point, and use the tip of your iron, or your trim iron with the flat blade, and stick the crease right into the area where the flight surfaces and the fuse join. Work out onto the flat sides of the strip, and seal them down real good. Work your way back to the trailing edge, and forward to slightly wrap around the leading edge.

Make sure this area is sealed down tight.

With small fillets, you can omit the crease, and use the curved sealing head, or the back of the tip of the full sized iron.

The trailing edge.

Cut a strip slightly longer than the wing panel, and about 1/4" wider than the trailing edge where the hinges will later be installed.

Iron on the flat first, then roll the edges over, on the top and bottom of the trailing edge. There should be at least 1/8" of covering on the top and bottom of the trailing edge.

The wing and stab.

The wing and stab cover almost identical, so what is said should pretty well apply to either.

Cut a piece of film that's at least 6 inches longer, and wider than the surface to be covered. Don't be cheap and skimp on this as you'll need the excess to grip as you heat form the tips, and leading, edges.

Turn the plane on it's back so you can cover the bottom of the wing first.

Set your plane on your covered table with at least 3/4 of the wing supported. (Here's where those blankets or pieces of foam come in handy.)

With your full sized iron, tack, (touch with the iron long enough to activate the heat sensitive glue.) 3 or 4 places on the wing panel, next to the center of the strip applied in the joint previously. In the case where you have a small fillet, set the edge where the curve starts, and tack in a similar manner.

You want the wing tip free, and hanging over the edge of the table for this step.

With your free hand, grip the end of the film, near the tip, and put some tension while applying heat from your heat gun near the wing tip. Continue to pull as the film gets soft from the heat. Instead of shrinking, the film will stretch. Continue with the pulling heating and stretching until you have formed the curves at the tip. This is called heat forming . If you continue to work with the heat gun and stretching until you get to a point somewhat past the center of the wing tip, you should, with practice, be able to make a seam without any puckering at all. The heat forming also slightly tacks the formed tip in place, but it will be necessary to seal it down solidly later.

At the trailing edge, use your free hand and put a little tension at the center of the span. Tack with your iron. Do the same thing at three or four more spots, before moving to the leading edge.

Again, use your free hand, at the center of the excess at the leading edge. Use your heat gun and in a similar manner as the tips, heat form the curve over the leading edge. Start at the center, and work your way to the root and tip. A light rubbing with a soft cloth right after applying the heat, will tack the leading edge into place. You can also stretch a little past the center of the leading edge, similar to the tip.

Once all the heat forming and tacking is done, you can iron the covering permanently into place. \Start by tacking between the previous tacks, then go for the whole thing and seal it down solidly.

At the trailing edge, pay some extra attention to the overlap. Make sure it's sealed tight.

Use a new single edge razor, or your trimming tool and trim the excess from the surface.

Turn the plane upright and do the top of the same wing panel, in the same way.

You can either do the other wing panel in the same way, or use your heat gun to shrink the covering tight on the first panel. In either case, when doing the final shrink, work a little on one side, and then the other to try and keep warps from being shrunk into the panel. If you do get any warps, they can be removed with a little twisting and heating later.

Some like to seal the covering to the leading and trailing edge, as well as the cap strips at this point. I don't prefer to do this as it makes it more difficult to remove warps that may occur in the future. I also feel that unless you've done a superior job preparing the leading and trailing edge surfaces, any imperfections in the structure will be more apparent if these areas are sealed down tight.

Flaps and elevators.

Flaps and elevators, when not built up, are probably one of the most difficult areas to do and have look right over time. A careful bit of work here, and they'll look good. Hurry it up, and you'll be seeing bubbles and loose covering sometime in the future.

Of course, you've done the normal prep work, sanding, tack ragging, and Balsarite. But there're some additional small steps to do when applying the film.

You will need to cover the pockets you sanded for the hinge barrels. You'll also need to cover the flat ends and tips of the flap. Since I like to have my flaps end with a square 1/8" wide tip at the trailing edge., I cut a strip of film at least 3/8" wide and apply it to this area. I roll the 1/8" overage onto the bottom and the top of the flap or elevator. Seal the edges down tight.

For the flat ends, cut a strip in a similar manner and stick the center and then the entire flat. Roll the excess as you did the trailing edge.

For the hinge pockets, it can be a little dicey. the idea is to stick the film onto the longest flat, then to each side, leaving the overage sticking above and below the pocket. Use your razor and slice the crease, formed when you stuck the sides of the pockets, to the top of the surface. Use your iron, and seal these little tabs tightly into place. Pay attention at the 45 degree leading edge.

Now we can cover the flat areas., best done by once again cutting a strip of film wider, and longer than the surface. Start once again on the bottom surface.

Lay the flap. or the stab, as they cover in a similar way, on a clean flat surface. Lay the film on top, carefully centering the film over the part. Use your iron, sock covered if you have it, in the center of the flap or elevator. Work the covering down from the center, to each side, and out to the tip. The idea is to not trap any of the gassing under the covering as you stick it down. Turn the surface 180 degrees, and in the same way, work out to the root. Be careful with the heat, as you can still get some gassing if you're not careful. Next, we need to do the 45 degree angle at the leading edge. Once that is done, cut and remove the covering from the hinge pockets. trim them tight, and seal the edges well. Turn the surface over, and continue the covering onto the other 45 degree surface. Once you are sure that every thing is stuck down tight, Use your razor, or trimmer, and trim all the excess off.

Turn the part over, and do the other side in the same manner. Flaps and elevators are almost identical in procedure.

Fillets.

This section is used for larger fillets, especially when you are painting the fuse. It can also be used with some minor variations when both the flying surfaces and fuse are film covered. In this case, you will paint the fillet with a matching color. LusterKote works for me in this case.

I like to pink the edge of the covering adjacent to the fuse for this method. I cover the wing as before, then form the fillets. You can use epoxylight, epoxy and micro balloons, leather fillets, or balsa fillets to form the fillets.

Before installing the fillets, take the time to tape a line about 1/8" further onto the wing than the edge of the fillet. This way you won't get glue onto the finished surface of the wing. If you covered your wing before installing it, you would do this also before gluing it into place.

Install your fillets. After the fillets are in place, remove the tape, and re-tape about 1/16" to 1/8" further out. sand the edge to a feather edge. Other than covering the fillet with coating of spot putty, the fillets are ready to be painted.

Covering the fuselage.

If you have chosen to cover the fuselage with film, here is the method to use.

It's important to have all the lap joints going towards the bottom of the plane, as well as toward the rear of the plane. This acts in the same manner as a shingle, and resists oil seepage. The exception here is the nose ring. Stick it into place first. Make it about 1/8" to 1/4" larger than the nose ring itself. Once the flats are stuck down tight, you can make slices every 1/4 inch around the radius, now, stick these tabs down very tightly.

Start on the bottom of the fuse, and from the rear, use the largest pieces you can to minimize the laps.

At all times, try to start in the middle of the piece you want to stick down to avoid gassing the glue with the heat. Once all the bottom is done, roll the edges up the side, approximately 1/4". Make sure the covering is stuck tight, especially at the edges.

The side pieces can now be applied. One piece if possible, but most of the time, I'll use two pieces, with the lap at the high point of the wing. Again start at the middle and work out towards the edges. the trimmed bottom edges are finished off flush with the bottom if possible.

Lastly, comes the top piece. Pay some attention here, as this is what will be seen most of the time. Due to the compound shape of the top blocks, it's best, in most cases, to do a bit of planning before applying any covering. If possible, figure

where your trim lines will be going, and make your laps in a place that the trim will cover them.

Depending on the shapes, it's sometimes necessary to do the turtle deck in two pieces with a seam at the top center, running lengthwise. Again, work from the back forward. Make your lap at the back edge of the cockpit if possible. Sometimes it's necessary to use the heat gun and do a little heat forming before ironing the covering down. The downside of this happening is that it will be more difficult to avoid gassing the glue, so be careful. With a little work and some attention to detail, the fuse is done.

Painting the fuselage.

Use your favorite method to prep the fuse for paint. Most paints with the possible exception of water based paints will adhere sufficiently to sanded or scuffed film covering, but the best adhesion comes with paints that are formulated to adhere tightly to any surface. These include Epoxy paints, LusterKote and it's kin, and Enamels. Be careful with these paints as they are not lightweights. Make sure the film covered surfaces are masked off to avoid getting any paints where you don't want it to be.

A better film covering method.

I mentioned earlier that there was a better method to use for film coverings.

It will work much better than film on bare wood, won't bag up, loosen, or cause problems down the road.

Pre-covering.

First, pre cover the flying surfaces with silkspan, silk, or Sig Koverall. Koverall as a pre covering is the strongest, and also the heaviest of the options, but the strength is unbelievable.

The chosen pre covering should be coated with one or two coats of thinned dope, or better yet, Balsarite, thinned 50-50. The fuse, if you are going to cover with film would be treated the same way.

The beauty of this method allows the gasses to bleed off easily, due to the porosity of the substrate. The film adheres to the substrate, and the substrate stabilizes the film. I have seen planes several years old which have never had their film sag or bag up. They are still as tight and smooth as the day they were first covered. On some of these planes, you have to look very close to tell that they are film covered.

In addition to all this, the covering winds up being stronger than either layer alone. I believe it's a win win situation.

Attaching the film.

The method of film attachment is slightly different than the traditional method outlined above. But it's sufficiently similar, that with a few minor changes much of the earlier techniques will work quite well with it.

The biggest difference is when covering the wing panels.

Start by tacking the edges around the entire perimeter. Once tacked, use your iron, covered with a iron sock if you have one, and start in the center of the middle open bay. Work your way out to the rib caps. Iron down the rib cap, and move out into the middle of the next bay. Stop at the last bay next to the tip, and where the center sheeting begins next to the fuselage. We'll still heat form the tip to get the best appearance. Once all the bays are sealed down, add some additional tacks to the leading and trailing edge. Use your heat gun and some tension from your free hand to shrink and form the leading, and trailing edges. The heat from the gun will slightly tack the surface to the substrate. Use your iron to finish sticking the film to the substrate.

If you did it right, it will be stuck to the substrate. there will be no sagging or bubbling. the surface will be smooth, and will stay tight and smooth.

This works quite well over solid balsa surfaces as well. The solid surfaces will be smooth and not wrinkle or sag. Fuselages will also look as good as the flaps if you do it right.

Attention to details.

Another advantage occurs when you do your trim.

With the traditional method, one usually either paints on the trim, or sticks colored film onto the base film for the trim. The problem with this is that there is no place for the gassing to go, so bubbles come up and even after the pin pricks and re-sticking, you can always see where they occurred.

With this method, and a little pre-planning with your trim scheme, you can leave areas free of the film, and apply the trim colors right to the substrate. All that is needed is to use a minimum of 1/8" laps. With intricate trim schemes, it's again best to work from the back to the front, as it keeps the laps facing away from the airstream.

Transparent films over these substrates look an awful lot like dyed dope finishes.

Weight build up can still be less to about the same as a traditional painted finish.

The finish.

There it is. Most of what I know about using film coverings. I may never make Concours, but I often am complimented on my finishes. I'm sure there are others methods as well as tips from others to add to this, and I hope that some of you find it useful.

The Legacy pictured here has been crashed, pan caked into the asphalt, repaired and is now over a year old. It was covered using transparent MonoKote over silkspan, and the covering is still tight, no wrinkles, bags, or sags. During the crash, a small tear resulted when the force of the impact broke the outboard stab leading edge about two inches from the fuse joint. I repaired the tear using the old method, Ambroid glue.

I'm wondering why everything is spinning around?