



## Making It Look New Again

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(Off with the Old, on With the New)

### Recovering Techniques for ARFs or Repairs



A shorter version of this article was originally published in *Model Aviation* magazine. Model Aviation is the monthly 180-page plus, full-color magazine published by the [Academy of Model Aviation](#) (AMA) for its members. As this is a very important How-To article, Sport Aviation is publishing this expanded version. The knowledge and techniques presented here will help both new and experienced pilots.

The Sport Aviator title implies that the techniques can only be used to refurbish an old model. They do work well for that purpose. But the same techniques can be used to personalize even a brand new ARF airframe as well as repairing a damaged airframe.

Even experienced pilots sometimes suffer from the dreaded “Dumb Thumb” syndrome and damage is the result. Imagine you’re out at the flying field at 10 AM on a bluebird-fine Saturday morning. Clear skies, no wind, and the happy buzz of motors fill the sky. Sipping hot coffee from a Thermos, your friend, Bill, looks on approvingly as you make “touch ‘n goes” across the runway with your favorite sport airplane.

But, the fates are fickle today. On this “final” pass (*Ed. Note: It is always that “final pass” that gets you.*), your right wing tip stalls, digs in and your pretty little ARF cartwheels down the runway like a Rumanian gymnast. When it finally comes to rest, the structure is somewhat intact but the covering looks a lot worse for wear from its recent brush with the blacktop. As you bring the pieces of the model back to the bench, Bill asks, “So, what you gonna do now?”

Your answer may come down to a decision between your wallet and your willingness to learn new skills. You could go out and buy a replacement ARF; that’s your wallet speaking. Or, if willingness whispers in your ear, you could learn to recover your model.

Recovering a model doesn’t always involve a crash. Wear, tear and time can be stimulations for recovering an airplane. The sharp metal molding on a car or the wooden corner of a work table can produce a dent here or a puncture there. That, plus the normal wear and handling from flying can necessitate a recovering job. Another reason for recovering a model is less about the flying qualities and more about not wanting your airplane to look like all the other ARFs at the field. Recovering can let you express your individuality, resulting in a compliment like “I didn’t know that airplane came in that color scheme.”



Photo 1

Looks like a lot of tools are required. If you are an experienced modeler, you have these already. If not, even RTF assemblers need most of these items, especially the heat irons and heat gun used to tighten [RTF](#) and [ARE](#) coverings.

Of course, if this is your very first covering project, you might want to try borrowing some of the more expensive items. Borrowing a few tools can be a good option: Ben Franklin said “neither a borrower nor a lender be”. But while we know that Ben flew kites, the odds are zero that he covered them with iron-on plastic coverings.

Borrowing some tools and time from a flying buddy who knows model covering can be excellent “tools” to have in your shop. Covering is not hard to learn, but having a friend who knows how to do it can significantly reduce your learning curve. As for lending, on my first covering job I hardly knew what a heat gun was until my friend, Don, came over and lent me his. With a few passes from what I took to be an overgrown hair-dryer, Don tightened up my plastic covering, pulling out sags and dimples, and making my airplane look a lot more like a knowledgeable builder had covered it. So, the moral is, check out whether a friend or your club can loan you tools, especially more expensive ones like a covering iron, trim iron or heat gun. *(Ed Note: Don't ever, not ever, use a covering heat gun as a hair dryer. A model covering heat gun blows out air at temperatures above 450 degrees F. YES, above 450 degrees F. That will not only dry your hair, it will burn it off. Your scalp will melt, your brain can boil and you will definitely be hospitalized for some time. Then, who will be recovering your airplane?)*

Table 1 explains tool usage and which ones are required and which are optional. In addition, make sure you have a large, clear work surface with good lighting, ideally from two sides. A large towel, laid under the model covering you are working on, helps prevent scratching of the film.

**Table 1: Project Tools**

	Name	Usage	Required?
<b>Surface Preparation Tools</b>			
1	Lite Spackle	Filling small dings, scratches, cracks	Small amounts usually needed
2	Vinyl Spackle	Filling deeper gouges	
3	Palette Knife	Application of spackle	Yes – Plastic knife will work
4	Sanding Blocks – 240-320 Grit	Sanding of structure prior to covering	Yes
5	Tack Rag	Removal of sanding dust prior to covering	Yes
Not Shown	Acetone or Lacquer thinner	Removal of excess adhesive, small, stuck bits of covering	Yes if excess adhesive
Not Shown	Rubber gloves	Wear when handling thinners	
<b>Cutting and Measuring Tools</b>			
6	Single edge razor blades	For cutting covering - straight lines	If using just the hobby razor knife,

7	X-Acto Knife with extra #11 blades	For cutting covering - curves	change blades frequently
8	Pilot water based fine-line marker	For marking covering during cutting	Yes – Make sure it is water based
9	Scissors	Good for trimming small edges	Optional
10	Cutting Surface	Synthetic cutting board, glass, or Masonite – Avoid wood with grain	Yes
11	Steel measuring rule, straightedge	18” and 36” rules for measuring covering and cutting straight lines	Yes - Carpenters framing square a substitute.
<b>Covering Tools</b>			
12	Iron-on covering	Material you cover the model with	Yes
13	Coverite Ironex thinner	Cleaning covering irons, removes excess glue	Yes
14	Covering iron with sock	Tacking, adhering covering to airplane framework, tightening covering	Either covering or trim iron required. If only trim iron you will need heat gun.
15	Trim iron	Same as above but adhering small trim pieces	
16	Extra tip for trim iron	Flat and curved tips for trim iron to fit appropriate surfaces.	Comes with trim iron
17	Covering thermometer	Setting temperature of iron	Optional – not needed if thermometer built in

If your project is a repair, evaluating damage determines the “recover or buy decision”: Your first step in recovering is to evaluate the pros and cons of recovering your airplane vs. buying a new one. To assess the condition of your model, disassemble it, removing the landing gear, motor, radio gear, and pushrods, followed by a visual inspection of the airframe. The structural damage on the Tiger 400 used in this exercise was minimal and repairable, so recovering rather than buying a new ARF was the better choice. Besides, when completed, the Tiger 400 will look different and better than new.

For structural repair techniques, read the Sport Aviator Article” [ARF Wing Repairs](#)” in the Flight-Tech Section. The same general repair principals can be used on a damaged fuselage as well. Remember, everything must be kept straight and aligned once repaired. If the damage is such that proper alignment is not possible, it is not truly repairable.



Photo 2

Removing All of the Old covering is Essential: Once the re-covering decision has been made, it's time to remove all the old covering unless you plan on retaining the same color scheme or just recovering a broken or punctured part, such as a wing.

If you only cover one part, do some research to find out what brand of covering the model originally used. Matching the same brand will facilitate matching the original film color. On the Tiger 400, the kit instructions state clearly that the airplane was originally covered with Cub Yellow and White Oracover film.



Photo 3

To remove the old covering, first warm the old covering with heat gun to loosen the adhesive. Wear cotton gloves to protect your hands; at temperatures of up to 450°F, a heat gun can burn an uncovered hand. As you pull off the covering, go slowly and pull at an angle to minimize residual glue problems. A covering iron can also be used to loosen the adhesive if you do not own a heat gun.



Photo 4

Once you have the covering off, remove any residual adhesive or stuck bits of covering with Acetone or a covering thinner like Coverite Ironex. Acetone and the toluene in Ironex are toxic, flammable, and can be absorbed through the skin so wear rubber gloves and have adequate ventilation.

Working outside on a folding work bench covered in plastic is a safer way to use these chemicals. A spot remover like K2R (if you can find it) can be used to remove and absorb fuel stains on a glow model. *(Ed Note: Since K2R is extremely hard to find today, there is an even better way to remove oil from wood. That good ole' heat gun works wonders on oil-soaked wood. Keep the gloves on, hit the wood with full heat; close up. The oil will bubble out of the wood. Wipe away the oil that surfaces with a paper towel. Repeat the process until the wood is dry enough to cover. I have used this method for 20 years and some early airplanes recovered like this are still flying and the covering is still adhering well.)*

As in painting or wallcovering, good surface preparation and surface damage repair makes the final covering appear professional: Now that the covering is gone, re-inspect the model for cracked ribs, broken spars, cracked sheet surfaces, loose engine and landing gear mountings. If the airplane needs repairs or additional re-gluing, now is the time to do it.

Once the repairs are made, fill nicks and dings using light or vinyl spackle and a palette knife. Lightly sand the surface with 240-320 grit sandpaper. When you are done sanding, wipe it off with a tack rag, running your finger over the surface and holding it up to a light at an angle to a light to check for imperfections. If you can feel or see any imperfections now, you'll see them later when it's covered. Covering does not hide poor workmanship under it.



Photo 5

Careful pre-assembly saves time later: Pre-assembling the model, before recovering, ensures all surfaces fit together and all hardware is in place. During the trial assembly, be sure to check the following items if they are on your model:

- **Dowels:** Remove these before covering if possible. Fit them, unglued, during the pre-assembly. If the dowels, usually rubber band hold-downs or forward wing mounts for bolt-on wings, can not be removed, it is easy to cover around them. Do not damage the airframe just to remove dowels.
- **Hinge slots:** Cut slots and fit hinges in the wing, stabilizer, and control surfaces prior to covering. Make sure control surfaces flex easily. If using Mylar type hinges, read the Sport Aviator article "[Installing Mylar Hinges](#)" in the Flight-Tech Section. If the hinge control surfaces are still attached using Mylar type hinges, just cut the hinges with a sharp hobby razor knife. Remount with new hinges located adjacent to the ones cut.
- **Control Horns:** Fit these prior to covering. I sometimes inset 1/32 or 1/16 plywood behind a nylon control horn on a sheeted surface to keep the control horn from flexing or worse, the screws pulling out. (*Ed Note: a neat trick is to slice a centered hinge groove under the control horn and insert a Mylar hinge all the way inside. Use thin CAA to lock it in place. This strengthens the control horn mount as much as do plywood inserts but is faster.*)
- **Pushrods and pushrod exit covers:** Fit these before covering, making sure the pushrods line up with the control horns.
- **Structural improvements:** On an ARF, check to make sure there are enough internal braces for the control push rods in the rear of the fuselage to keep the cable from flexing and causing control inconsistencies. If you want to change from a wing held in place using rubber bands, now is the time. For details read the Sport Aviator article "[Not Your Stock Hobbistar Part One](#)" in the Pri-Fly Section.
- **Air vents:** On open surfaces, like wings and some stabs, drill small air vent holes in the ribs if there are none. (*Ed Note: An Excellent Point. This allows the heated air under the heat gun to escape to a cooler area so the covering over the heated area can "lay down" properly.*)

When you are done with the pre-assembly, disassemble the model to begin covering.

### FIRST STEP

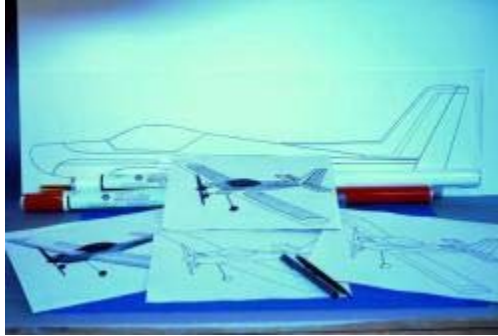


Photo 6

Designing is the key to covering success: Before you do begin covering, create a covering plan to make the covering job a lot easier and to produce better looking results. Here's a simple way to put one together.

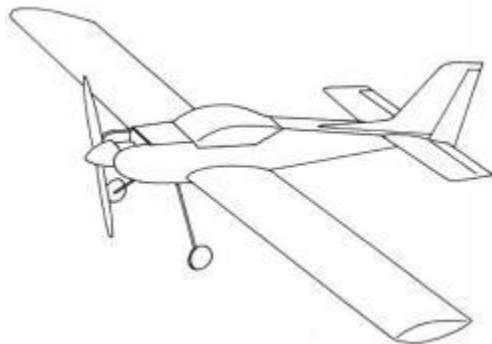


Photo 7

A covering plan starts with a photo of the model from a box top or off the Web. Blow it up to fit an 8-1/2 x 11 sheet of paper using a copier. Make some copies of it. Then make a line drawing of the major components of the airplane minus any surface decoration by tracing over the top of the photo. Make copies of the line drawing and then sketch your covering design on the copies until you are pleased with the results.



Photo 8

I make multiple sketches of different wing and fuselage patterns until I have something I like. During this process I often look in books or on the Web for design inspiration. When done, again make copies of your covering design and then shade the drawing with pencil to create a light and dark value drawing. It's the contrasting light and dark pattern along with good color choices that

make an airplane readable at a distance. On complex designs, I often make full-size paper patterns of the design. Last, choose colors that appeal to you and that work with your design.

### **Editor's Sidebar**

For those of us who are not artists and who do have a PC computer, there is another way to make your outline drawings. Copy the views of your airplane just like Jon outlines. Rather than make copies of them, scan the various outlines at 50% into Paint; almost all PC computers arrive with this program installed.

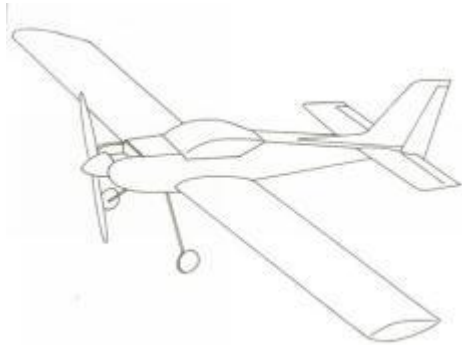


Photo 9



Photo 10

Photo 9 shows the scanned line drawing (or a tracing) in Paint. Remember to reduce the scan size by 50%. Then use paint to draw what ever design you desire. Photo 10 shows some of Jon's colors applied using the program. Get as creative as you want. With Paint's enlargement detail tool, almost any design can be drawn in by us "Art Hackers" such as me who couldn't detail an airplane outline if Michelangelo was guiding my hand.

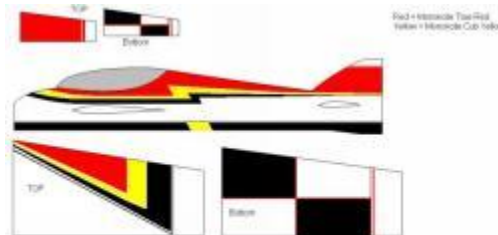


Photo 11

Just to show it can be done by an untalented duffer like me; photo 11 is the color design for my new Integral Precision Aerobatic (Pattern) airplane. (For information about Precision flying go to: <http://www.nsrca.org/>) Jon has a great idea about tracing the box and various magazine photos to start, wish I had thought about that. After getting the outline, either make several enlarged copies as Jon suggests of try using Paint. Either method will give great results.

Your choice of a covering material determines not only what your airplane will look like, but may affect how it performs. This is especially true of smaller electric-powered aircraft. Choosing a covering means making the right choice for your model. Before you can decide on the colors, you'll want to decide if your model will be covered with opaque or transparent film – or some combination of them, and which brands of covering come in the colors you want to use. To choose a type and brand of covering you need to understand the differences between coverings.

Iron-on coverings come in four types; high heat, low heat, fabric, and light films. Fabric coverings are mainly used on heavier scale models of airplanes that were originally fabric covered and I'm

skipping them because the Tiger 400 is a lightweight, non-scale airplane. Table 2 describes the differences between iron-on plastic film coverings:

**Table 2: Comparisons of Iron-on Plastic Film Coverings**

	High Heat Film Coverings	Low Heat Film Coverings	Light Film & MicroLite Film Coverings
Brands	21st Century Film MonoKote UltraCote	AeroKote Black Barron Film EconoKote Polycover Supercover TowerKote	AeroKote Lite 21st Century MicroLite Nelson LiteFilm
	Over 30- 50" wingspan		Under 30-50" wingspan
Recommended For	Models that require fuel proofing, durability, structural integrity, and wide color choice.	Models with foam, covered foam, foam board, plastic, or where cost is a factor.	For lightweight park flyers and indoor models
Not Recommended For	Foam, plastics	Designs needing great strength in the covering	Planes over 50"
Weight1: Oz/Sq. Yd.	1.8 - 2.5	1.8 - 2.5	0.6 - 1.8
Heat1 to Affix to Wood	225-325°F	200°F	135-200°F
Heat1 to Shrink Covering	Up to 350-400°F	Up to 250°F	Up to 250°F
Colors	Largest color range.	Limited color range.	Limited color range.

*Weights and heats shown are an approximate range. For exact weights refer to the web site for a specific covering. For the exact heat ranges to affix the covering to wood or to shrink it, refer to the directions that come with your covering.*

For the Tiger 400 I decided to use Coverite 21st Century MicroLite film; a light, iron-on plastic covering suited to models under 50-inches in wingspan. Because the Tiger 400 is a light weight electric, it does not need a heavier covering with fuel proof qualities. And, because the Tiger 400 is lightly built, it does not have structures to resist the force and pull heavier coverings create when they shrink that can lead to warping or breakage.

Table 3 shows the specifications for MicroLite, the film I have chosen to cover with. No matter what film you choose you should be aware of the size roll it comes in, weight, temperature rating, and color selection.

**Table 3: Coverite 21st Century MicroLite Specifications**

Name	Manufacturer	Size / Form	Weight /Yard2	Temperature to Affix Covering to Wood	Temperature to Shrink Covering	Colors Available
21st Century MicroLite	Coverite	27-3/4" X 72" Roll	0.6 Oz.	175°-195°F	230-250°F	7 opaque, 4 transparent, & clear and silver films

If you can carefully Estimate materials with a cutting plan, that saves time and money later: Now that we've chosen the covering and colors, you'll need to estimate the number of rolls of covering required. Again, a little planning now may save you a long drive to the hobby shop later. Here is how to plan your covering materials and make a cutting plan:

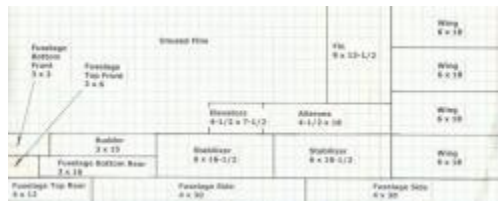


Photo 12

To create a cutting plan, make a scale drawing of each 27 3/4 x 72-inch roll of Microlite covering on a piece of graph paper. Label each one for color. Each 1/4-inch square represents 1 1/2 inches of covering in my example (photo 12) but you can use whatever scale is convenient. Measure each and every panel of your airplane and sketch them out on the graph paper, making sure to add dimensions and label them. When measuring a panel, add at least 1-inch on all sides of a panel and 3-inches at a wingtip for handling and stretching the film. If the covering needs a great deal of stretching as on a rounded nose, add even more than 3 inches for handholds.

My cutting plan indicates that I needed one roll of transparent yellow Microlite and one roll of opaque white as my primary colors. I am also using a small amount of opaque red for trim. If your airplane is large, remember that most films come on a 6-foot long roll but several brands also sell 15- or 25-foot rolls, ensuring color consistency for larger modeling jobs. Some brands also sell smaller "trim" rolls that can be used for trim colors such as the red used here.

### **LET'S START COVERING**

The Iron is Hot. But is the temperature right? Setting your covering or trim iron to the correct temperature will make all the difference between a great covering job and hours of frustration and burned or melted plastic. The two temperatures you need to know (MicroLite temperatures shown in brackets) are:

- Temperature for affixing the covering to wood: A low temperature (175°-195°F) is used to tack or seal the film to wood. The film won't shrink much at this setting.
- Temperature for shrinking the film: The temperature at which the film will shrink tight. Note that this is a range (230°-250°F). Ideally, use the lowest temperature you can to tighten the film. If you want to retighten it later you will have to use a higher temperature than what you originally used, By using a lower temperature to start with, you will have some temperature latitude to tighten it later if needed

It's worth noting that this last temperature only makes sense if you are using a covering iron to shrink the film. I mainly use a heat gun for shrinking film but these have no accurate means for setting temperature.

To learn what the correct settings are for the film you choose, read the directions that came with the film. Manufacturers like Coverite and retailers like Tower Hobbies publish information sheets and technical notes on specific coverings which are quite helpful.

Once you learn what the correct settings are for your film, the fastest and surest way to set the correct temperature on an iron is by using a Coverite Pocket Thermometer. To use the Pocket Thermometer, turn on the iron, warm it up for 15 minutes, then set the gauge on the sole of the iron and get a direct read of the temperature. The Sealing iron has a direct read thermometer and a light to indicate when it is up to temperature. This little item is inexpensive and will last forever.

An alternative to a thermometer is to make tests on scraps of balsa to see at what setting the iron affixes the film to the balsa. Start low and turn up the heat slowly to avoid burning the covering. Once you know the setting, write it down.



Photo 13

I am forever being interrupted when I try to work on a model. Because of this, I use a metal tool rest for sealing and trim irons and put them on a tile square well away from anything flammable (such as thinners). I try to remember to unplug irons when I will be away for any length of time but using a tile gives me added insurance against accidents.

If you follow a Logical Process it makes covering easier. There is a definite logic to covering and four main points to remember:

- **Start small or start simple.** Learn to cover by practicing on scrap balsa or on a smaller object like a simple wing, a rudder or stabilizer until you have a feel for temperature and the tools. Do more difficult items like a fuselage later.
- **Cover bottom to top, back to front.** Imagine air and fuel running over your model from front to back and from top to bottom. If the edge of a seam faces down or back it will be much less likely to show when light hits it, catch air from the slipstream, or collect fuel and dirt under the seam.
- **On wings and stabilizers, cover the bottom first and the top last.** Overlap the top covering around the leading edge and slightly over the bottom by 1/8. On a fuselage, cover the bottom first, then sides, then top. There can be exceptions to this depending on how the model is constructed.
- **Overlap dark over light, opaque over transparent:** On a two color scheme, try to have the darker color overlap the lighter one or opaque overlap transparent covering. With my Tiger 400 color scheme, the white on the front of the fuselage and wings will overlap the transparent yellow.
- **Hide seams under trim.** If a trim piece is applied on the side of a fuselage or striping on a wing, use it to hide a seam if there is one. On my Tiger 400 the red wing striping hides the seam where the white overlaps the yellow. White MicroLite is not very opaque and some of the yellow color would show through without this trim layer. It also hides the sometimes not so straight cutting lines.

Covering the wing and control surfaces in two colors is not that hard: I decided to cover my wing in two colors, transparent yellow over the open rib sections and opaque white on the leading edge, wing tip bay and center section. This will create transparent "windows" in the wing and to me this improves visibility at a distance besides looking great. If you don't want to get involved in a two color covering job, you can follow these directions and cover the entire bottom of the wing first and then the top. Most directions that come with rolls of covering illustrate covering a simple wing as an example.

The design drawing for the Tiger 400 shows a curved shape for the transparent sections on the wing. One way to do this is to add small sections of balsa sheet in the shape of the curve at both tips and the center section of the wing. Here's how:



Photo 14



Photo 15

First, make card stock patterns for the curves and transfer these curves to 1/16 sheet balsa. A tip shim pattern is made to fit 1/16 under size at both the top and bottom edges. Cut out of balsa and

then glue in place. The 1/16 square balsa strips are added at the leading edge to catch the balsa curved piece. With these in place, you now have something to anchor the curved sheet balsa pieces. Once the pieces are glued in place, fill any imperfections and lightly sand.



Photo 16

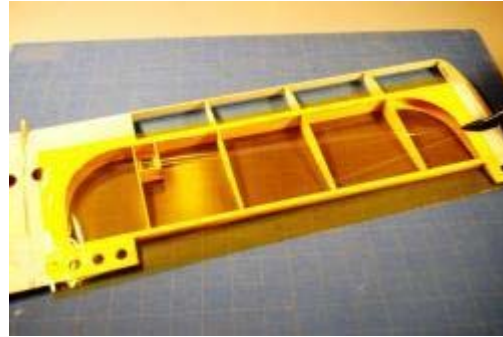


Photo 17

Begin the wing by covering small items like the inside edge of the aileron cavity. A trim iron is ideal for these small pieces. The forward edge of the aileron cavity will be covered by the film from the top and bottom of the wing. I like to place the wing on a towel to avoid scratches to the film while working on it.

Wings are covered bottom first, top last, so that the top film overlaps the bottom film. To begin covering, I cut the transparent yellow covering according to the cutting guide. To cut the covering, lay it on a cutting board; adhesive side up. With transparent material, a cutting board marked with a 1-inch grid makes this operation a snap. Mark the covering with the water-based Pilot pen. Cut the covering from the roll using a steel rule and a sharp hobby razor knife. Then, remove the backing and lay the covering on the bottom of the wing.

I try to employ a V-pattern for attaching the covering whenever I can (photo 17). Begin by tacking the inside center seam and then stretching the film tightly to each side of the center. I then form a symmetrical V out to the tip. Once the V is formed, begin at the center of each side and tack at about 1-inch intervals out to four corners. Once it is tacked, seal it down to the wood.

Cut notches for the film around each rib and seal it down to the spar, then seal it to the trailing edge as well as the center and tip of the wing panel. Seal all edges again and then shrink with heat gun. I often employ a tactic of sealing down more edge than I know will eventually remain on the model to assist in keeping the film attached while I heat shrink it. I also routinely reseal film after shrinking with a heat gun as the gun can loosen the adhesive. When all this is done, trim the panel.

Shrinking film with a heat gun is more art than science. Generally, try to work the entire piece at one time, starting 3 - 4 inches above it. When using a heat gun, remember that you can always get closer and bring more heat into contact with the film. If you are using a covering iron, remember that you can always turn up the temperature. If you get too close with a heat gun, you can easily burn a hole in the film and that usually means you will recover that panel.

Keeping the heat gun or covering iron continually moving across the film will help avoid burn holes. Covering neighboring film with cardboard or a wet rag is a great tactic to avoid burning film. Once the film is taught, rub down any area on sheet balsa with a cotton ball to work air bubbles out and help set the glue. For small creases that don't pull out with the heat gun, I often remove them with a trim iron rather than risk getting too close with a heat gun. Reseal all seams after shrinking with a heat gun.

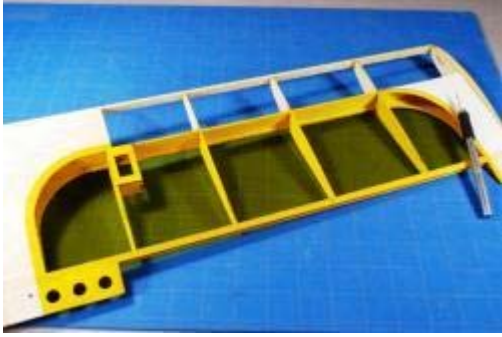


Photo 18



Photo 19

The ends of the finished, heat-shrunk, yellow wing panel are now trimmed using a cardboard pattern, a new hobby razor blade and a light touch. Apply just enough pressure to cut only the film and not the balsa under it. The trailing edge is also trimmed leaving about 1/8 in. wrapped around the upper side of the wing.

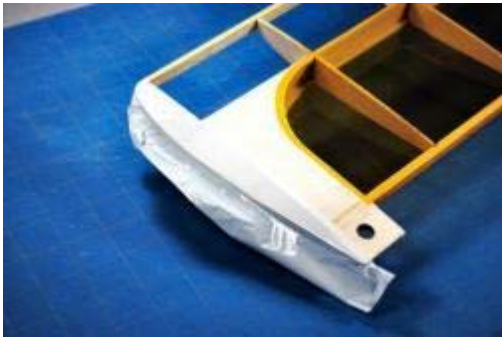


Photo 20

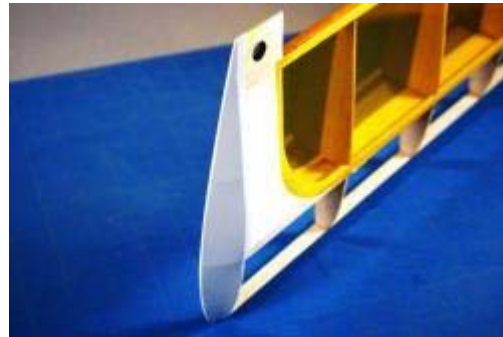


Photo 21

The tips are covered in opaque white. If you are doing a one-color covering job, cover the tips first so that the wing film will overlap them. On the Tiger 400, start with the bottom of the tip and then cover the top. Tack the film on the high point or spar position of the top of the end rib and then stretch and seal down that rib to the trailing edge. Repeat this for the leading edge. Then, beginning at the same spar location, stretch the film down and seal it to the outer edges of the tip. When done, carefully shrink it and trim off the excess. Repeat this for the top of the tip, making sure to overlap the bottom, and you have one tip done. Tips take time but the reward is worth it.

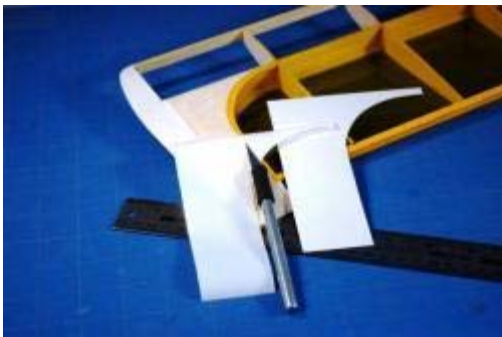


Photo 22



Photo 23

To cover the remaining curved portions of white near the tip and wing center, make a cardboard pattern to fit the space. This will be almost the same shape we filled with sheet 1/16 balsa. Add some extra film on the non-curved edges. To make the pattern and most of the other ones we will

be using, use thick poster board and a sharp blade on your hobby knife to ensure a smooth cut. When done, cut out 8 pieces of opaque white film.



Photo 24



Photo 25

For attaching the white panels, a trim iron again comes in handy. Keeping the seam small, tack at the lowest point of the curve and pull and seal down to the trailing edge overlapping the yellow slightly. Then finish the curve. Next seal down the center seam as well as the top edge. Finally, smooth out wrinkles, pushing out air bubbles and close up the seam at bottom. Shrink the panel with a gun or iron.

If using a heat gun a delicate touch is required. Cover up the yellow panel next to it with a piece of cardboard or a damp cloth to avoid burning it. Cotton is used to work out any air bubbles. Repeat this process for all the panels. When done, you can apply Top Flite MonoKote Trim Solvent with a small swab to seal the edge between the white and yellow film.

After these panels, you'll find the wing's leading edge is a snap to cover in opaque white. The bottom side is done first so that the top film overlaps it. The film is attached along the spar line, tacking it first at the center and then stretching and sealing down to the tip, taking care to keep the line straight. The leading edge is tacked in the center of the wing panel and tacked and stretched at one inch intervals in both directions.

When done, all edges are sealed down and the panel is shrunk and the excess trimmed off using a straight edge. Cover both bottom panels and then both top panels. The wing is now completely covered in yellow and white film. All that remains is to attach the red trim. (*Ed Note: In seam areas that will be hit hard with exhaust residue on glow aircraft, such as the top wing's red over the yellow/white seam, it is a good idea to wet a cotton swab with some trim solvent and quickly run it along the seam. This adds an additional seal to help fuel-soaked areas resist the oil. Wipe up any excess solvent quickly with a dry paper towel to protect the finish.*)



Photo 26

The next step is to cover the control surfaces. Most small pieces like the vertical fin, rudder, stabilizer, elevators, and ailerons need to have small strips of yellow added on their edges. I find this process tedious but necessary for a good final product. The pieces are then covered in transparent yellow using the same process we used for the wing; bottom first, top last.

If possible I prefer to cover all of one color, such as yellow, and then clean the covering and trim irons before switching to a second color. Irons pick up color from the film. Cleaning irons between colors helps avoid yellow or red smears across your snowy white film. Use Ironex to clean the irons when they are cold. Remember to avoid fumes.



Photo 27

It is time to cover the fuselage. Before covering the fuselage, paint the engine compartment using a paint color that matches the film near it. Use a fuel-proof spray paint, dope or polyester resin if the model is fuel powered. The Tiger 400 is an electric and was sprayed with non-fuel-proof white spray paint.

On a two-color scheme like the Tiger 400, plan ahead on the fuselage so that you cover dark over light, opaque over transparent, from bottom to top, and back to front. On the Tiger 400, the opaque white is on the nose with a stripe running down to the tail. The remainder of the fuselage will be transparent yellow with some red trim.



Photo 28



Photo 29

The bottom front and rear of the fuselage are covered first. Seam the front panel along the firewall followed by the back and sides. Shrink and trim off the excess. On the bottom rear fuselage, seam it aft of the wing and stretch and form a V to the tail. Then tack down and seal the sides. Shrink it and trim off any excess using a steel rule. Depending on the model, let about 1/8 to 1/4 in. overlap upwards onto the sides.



Photo 30

Photo 31

To cover the fuselage sides, seal the fuselage at the nose then pull and form a V back to the tail. Then tack and seal down the sides starting at about the wing saddle and the cockpit working fore and aft in both directions. You'll have to make small tabs in the film in the area of the wing saddle and cockpit to tack down the film. Seal the edges and trim the film. The top film on the fuselage is added last finishing off the transparent yellow film covering on the fuselage.

To add the white film to the fuselage, I made full-size paper patterns of the white trim before cutting the film. The pattern is used to mark the different color breaks on the fuselage. Generally, I try to overlap one color over the other by 1/8 to 1/4 in. depending on the opacity of the film. White Coverite's Microlite is not very opaque so keep the overlap small to avoid seeing a lot of yellow through it. With planning, the red trim will hide any show through.



Photo 32



Photo 33

The first step in applying the white film to the fuselage is to attach the rear portion of the white side strip over the yellow. The white nose portion then overlaps the rear side strip. The easiest way to attach this strip, and much of the other trim, on the model is to use Windex, a method that can "virtually" eliminate air bubbles between layers of film. Spray a light coat of Windex on the plastic, align the white film where you want it, and squeegee out the excess Windex with a credit card. Then clean up or work out any remaining Windex with a tissue.

*(Ed Note: From working in the paint development business for over 20 years, I have learned that formulations used in the various brand "window cleaners" vary greatly. Almost no two formulae are the same. Since Jon has found that Windex works in this application, use only Windex. Other brands, especially store brands, have lower and/or different solvent contents and may or may not work.)*

I find that pushing the credit card rather than dragging it works better and the edge of it can be used quite effectively to nudge pieces of film into place. If you do have any persistent air bubbles, prick them with a sharp pin and work out the air. Let one side dry over night before doing the other side or you may regret it. If it overlaps an edge, such as the leading or trailing edge, I tack the film to that edge with a trim iron. When the film is dry you can use very low heat on a covering iron to set the adhesive in the trim film and then seal the edges with trim solvent. If a piece does not look right when dried, it can usually be easily lifted, sprayed and repositioned.

To apply the white film on nose of the fuselage, make a poster board pattern to cut away the yellow under it leaving about 1/8 for an overlap. Align the cut film to the stripe and tack it. Then, stretch it carefully and tack along the edges of the nose. Shrink it with an iron or a heat gun. The red film trim strip was applied with Windex in the same manner as the white side stripe it overlaps



Photo 34



Photo 35

The Fin and Stabilizer are always fun parts because they mean the covering job is nearing its end and your "brand new" airplane is nearly ready to take to the air. For the white and red film on the fin and stabilizer, cardboard patterns were made and the white film was then applied using the Windex method. Seal the film onto the bottom and top edges of the fin and stabilizer. Red trim was then applied to all tail surfaces using cardboard patterns and Windex.



Photo 36

To finish off the wings, 1/4 in. red trim was cut from film in strips and curves using a very sharp hobby razor knife. The cardboard patterns for the curves were made easily with help from a Hobbico circle cutter. All red trim was applied using Windex, the adhesive set with an iron at low heat, and then sealed using trim solvent.

One of the hardest things to do is cut out small trim pieces like the 1/4 in. wide curves for the red trim and still get a smooth cut. Here are some tips: Use a new, sharp hobby razor blade. Make sure the pattern is smooth so the knife blade will not hang up on it. Tape one side of the pattern down and, while keeping pressure on the pattern, cut the un-taped edge in one smooth, continuous motion. Without moving the pattern, put tape to the other side of the pattern, remove the original tape and cut the remaining side. When designing these curved pieces allow extra film to overlap the adjoining piece.



Photo 37

The covering of the Tiger 400 is now almost complete as per the design drawing but it still did not look right to my eyes. I decided to deviate from the plan and add red, 1/8 in. Great Planes Kwik Stripe striping tape on top of the white side stripe and 1/16 in. white tape along the back edge of the tail surfaces to echo the line I formed on the wings. I had not really planned on using the red side stripe but once the airplane was done, it felt like it really needed one more stripe to complete the trim scheme. Striping tape was a fast and easy way to do it. I also cut the black canopy down in both height and length; giving it a sleeker appearance.

Learning to cover a model is a skill that anyone can learn. The results can be very rewarding, giving your model that custom, non-ARF look that will set it apart at the flying field. Like me, you'll probably also gain an added appreciation for how good the work is that comes out of the ARF factories. Good covering, happy flying.

Many of the techniques listed were developed from my own modeling. But I also learned some of them from the books listed below: They were a huge help to me and will certainly be worth your time as well.

- Radio Control Model Airplanes, by John Carroll, Kalmbach Books
- There are No Secrets, by Harry Higley, Harry B. Higley & Sons, Inc
- Tom's Techniques, by Tom Ingram and Harry Higley, Harry B. Higley & Sons, Inc
- Covering R/C Airplanes, Volume I, by Faye Stilley, Model Airplane News
- Covering R/C Airplanes, Volume II, by Faye Stilley, Model Airplane News

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