

How to Build and Fly the ½ A TEXACO POWERHOUSE

By Gary Sherman

I am frequently asked what makes a good first free flight model to build and fly. In my opinion, there is no better model than Sal Taibi's 1/2A Texaco Powerhouse and it is a good choice for several reasons. Almost any 1/2A engine will work well to power it, especially any of the Cox product engines or Texaco engine (these are especially easy to run and great for beginners). When completed, the Powerhouse makes a docile model, and flies at a beginner's pace. As skills and flying prowess advance, it is a very competitive model for the ½ A Texaco event and can be a good first step to get a novice into competitive flying. It teaches many of the basic building skills needed to continue in the hobby. These reasons (along with the fact that they all seem to fly well) make the ½ A Powerhouse a great choice. We want new flyers to be successful, and the Powerhouse is a great platform to ensure that happens.



Figure 1 shows a completed 1/2 A Texaco Powerhouse

The ½ A Texaco event has no minimum weight requirements (like many of the other free flight events – I.E. most old-timer free flight events have a minimum weight of 8 ounces per square foot of wing area). That means you can build as light or as heavy as you want. Because there is a limited amount of power available from a reed valve Cox .049 engine, keeping the model fairly light is a definite plus. The ½ A Powerhouse has a wing area of 540 square inches and can be built light, with a low wing loading. . There are a lot of trade offs regarding weight and I try to put strength where needed, and save weight where I can, within reason.

Getting Started

First of all, I order a plan. The ½ A Powerhouse plan is available from several sources, but we buy from Allen Heinrich of Aerodyne. You can find Aerodyne at, 17244 Darwin, unit C, Hesperia, California 92345. His contact phone number is (760) 956-2949 and his E-mail is AerodyneAl@aol.com. Aerodyne is a part time business, so call before going there. Since this is a model that was published in the 1930's, a copy of the original article is available from Society of Antique Modelers (S.A.M.) Librarian Gene Wallock for a fee of \$2.00. You can order the copy of the original construction article from Mr. Wallock at: Gene Wallock, 13 Sandy Trail Lane, Lawton, Oklahoma 73505. I usually do this first to look over construction methods and make sure I really want to build the model. Find a nice Cox reed valve engine. It is hard to believe, but they are actually becoming more collectable now that Cox has quit producing them and they are fetching collectible prices. One of the best sources to get one quickly is Ebay auction site, where there are always examples for sale. Now that you have made the commitment and have these items, it is time to get to building.

Let's build it

The first step in the building process is making the parts, and I start by taking the building plan to a local stationary store and make copies of the parts that outline rudder, stab, ribs and wing tips (see figure 2). These copies will be used as patterns to make the parts necessary to build the model. One neat thing about using the plan copies to make the parts is that the parts will fit perfectly when placed back on the plan (when doing the construction). Some plans come with a set of patterns, but beware; they do not always match the plan. This is especially true of older plans, that have been copied multiple times, and distortion has

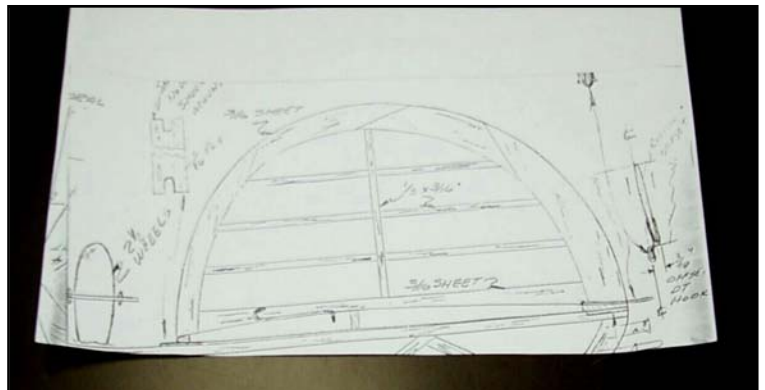


Figure 2 Shows copy of rudder outline

occurred. It is always a good idea to look over a plan and make sure everything looks correct. Make sure the wing will fit the wing saddle; the stab fits properly on the fuselage, etc.

Do a take-off of the wood supplies that will be needed. The necessary balsa can be purchased from several balsa suppliers. I always order more than I need so I can pick the weight of the wood I want for a particular part. There is a selection of light wood known as "Contest Wood" and this should be used in several areas to save weight and help later with the Center of Gravity. This will be explained more later, but most models tend to come out tail heavy, so building a light rudder and stab will help this.

Now that you have your copies made and your supply of balsa wood, you can start making the parts. Start by cutting out the parts of the copies.

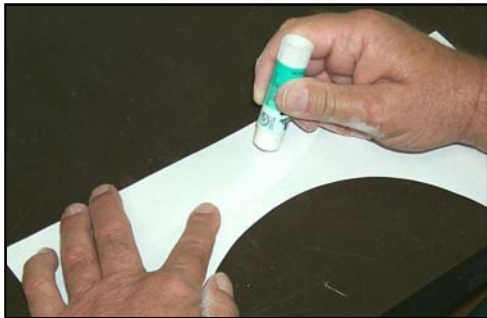


Figure 3 Gluing back of pattern

Then, using a temporary type glue stick put some glue on the back side of the paper and paste them onto the proper thickness and weight of wood (see figure 3).

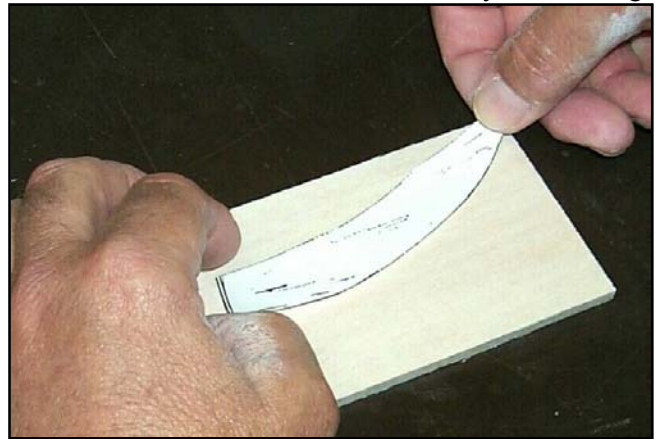


Figure 4 Line up grain and paste pattern to wood

Temporary glue sticks are available at most stationery stores. Most of the plans show the direction the grain on the wood should go, and it is important to pay attention to this as you paste your patterns on (see figure 4). I make all the perimeter parts out of contest wood. Contest wood is classified as 6 pound or less per cubic foot. Using some basic math, and a good scale, you can calculate the "poundage" of all the wood you will use. The reason I use light wood on these parts is because they are thick enough, that they do not need the strength the heavier wood might add. Again, saving weight where you can is always advisable.



Figure 5 cutting a second stacked part

Once you have your paper pattern pasted to the wood, you may want to stack more than one part under the pattern. Things like wing tips require two of each part, so by stacking them, you can make two at a time. You can either put a tiny bit of CA glue between the parts (very little so they can be separate later), or use a straight pin through both (see figure 5). Rough cut the parts around the patterns and leave enough so they can be sanded to the final fit. I use our



Figure 7 handy disc sander

scroll saw to cut out the parts. It helps a lot to have a scroll saw, but the parts could also be cut out with an X-acto knife or a sharp single edge razor blade. I think it is much safer, faster and precise to use a scroll saw. Mine is a Makita brand and I bought it at a local hardware store for under \$100. Once the parts are rough cut out, they can be sanded. You can hand sand them, but I prefer to use a stationary belt sander which I also purchased from the local hardware. It has the advantages of keeping the parts square, and saving a lot of time. I also utilize the round top portion of the sander to do inside radiuses (see figure 6). One of the handiest tools I have for making parts is a small disc sander. It was custom made, and the exact type is no longer available. Similar precision disc sanders can be had. It is also very handy all through construction (see figure 7).



Figure 6 sanding inside radius

One of the best things to come along in a while to add a lot of strength, but not a lot of weight is carbon fiber, and I do utilize it in certain applications. I like to apply a little medium CA glue, and rub the carbon down with a paper towel to set off the glue and get a good bond. Refer to figure 8 which shows me making a laminated spar for the Powerhouse stab. The carbon is placed on one side of the spar, and then the other side of the spar is placed over the top, sandwiching the carbon. This is done by using 1/2 the thickness of the wood shown on the plan. In example, if the plan calls for a 1/8" spar (as is the case of the 1/2 A Powerhouse stab which is 1/8" x 1/2"), using the carbon built up spar, use 1/16" balsa, carbon, and another 1/16" balsa. The carbon I use is a unidirectional carbon, .007" thick. I purchase it from Aerospace Composite Products, web site:



Figure 8 building a carbon laminated spar

<http://www.acp-composites.com/ACP-CAT.HTM> but it can also be ordered from several other sources including many model hobby suppliers. By being unidirectional, it is very stiff in one direction, and is ideal for this type of application. I glue about 6 inches at a time and wipe it down with a paper towel until it kicks the glue, and then lift the carbon and do another 6 inches. This works great and is much easier than trying to glue the entire piece at once. Towards the end of wiping the glue, a shot of CA kicker and more wiping will ensure the glue is fully cured. Because the Powerhouse stab only has one spar, this lamination will help keep it from wanting to warp upward when the covering is applied. The stab is supposed to be flat on the bottom, and sanded to an airfoil on top. The covering tends to pull the flat bottom up like a truss as the covering draws tight.

Starting assembly

I build right over the plan, but only after I apply Saran Wrap or Wax paper over the plan so the glue will not stick your parts to it. Either works as a release for the parts. If you glue your parts to the plan, you will have a real mess, so be sure to use one of the above suggested. I like Saran Wrap, while my son prefers Wax paper. As I said, either works fine.

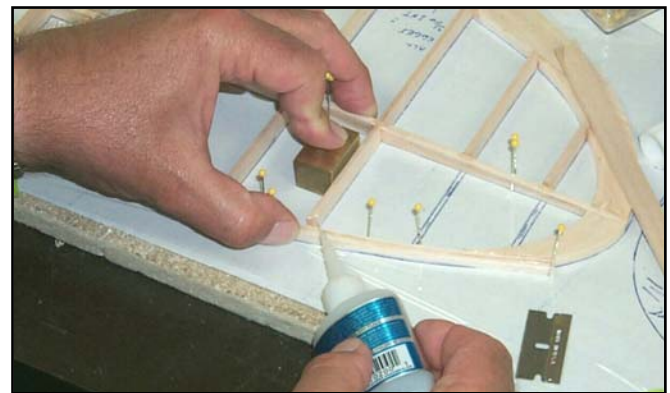


Figure 9 Gluing parts over protected plan

I used thin CA glue for most of my building, and apply it through a Teflon glue tip with a 1/16" outside diameter (Figure 9). These tips can be bought for about \$.50 each and there are a couple styles. One fits right over the stock glue bottle tip, and then some is sold in 1-3 foot sections, and is inserted into the end

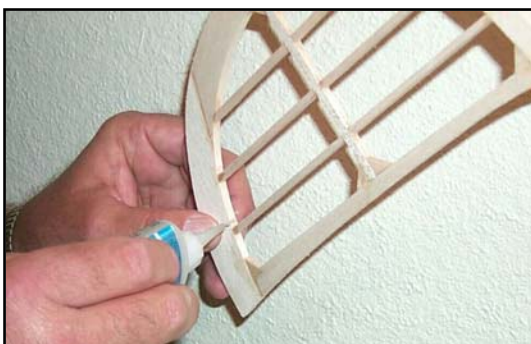


Figure 10 re-gluing joints on rudder

of the glue bottle tip. That is the type I use, cutting a 1" piece. It is helpful to cut the side that will be inserted into the bottle on an angle to get it into the tip easier. By using this tip, it really helps control the flow of glue. Usually, only one drop is needed. Without using the applicator tip, the glue just wants to run out. Try them; you will be glad you did. When the part is all built with thin CA and has had time to cure, I pick the part up and re-glue the joints with just a little more thin or medium CA (Figure 10).

only modification I make from the plan is to add gussets to both side of the rudder post as is visible in Figure 10. This helps to keep the glue joint solid after covering. Without them, I have seen the rudder post actually crush into the bottom of the rudder, and fail. When the assembly is all glued together, I remove it from the plan and I re-glue each joint with a small amount of medium CA for additional strength. I

Building the rudder for the Powerhouse is pretty straight forward. The



Figure 11 sanding rudder flat both sides

only use a small amount, again being conscious of the overall weight. When dry, I sand both sides to get it flat and then sand a uniform symmetrical airfoil to the leading and trailing edge (see figure 11).

The stabilizer construction is done in much the same fashion as the rudder. After I have it built, and have re-glued all the joints, I sand the bottom of it flat. On the stab, a lifting airfoil is sanded on the top of the stab (refer to plan). When done right, it will have a flat bottom lifting stab.

The first step in **building the wing** is making the wing ribs. I use a copy made from the plan and affix it to a piece of 1/8" plywood. I then temporarily glue another 1/8" piece of plywood to the first and drill two 1/8" holes through both pieces of plywood (see figure 12). I insert 1/8" dowels in the holes to hold all my ribs between the two completed templates and the holes will act as a vent when the wing is constructed. I sand and finish the two plywood templates to the outline and separate them. Now, they are ready to be used to make ribs. I

rough cut (oversize) my balsa ribs and a few at a time, drill the 1/8" holes through them, using one of my 1/8" rib templates as a guide (see figure 13). I can usually stack 1/2 of the needed ribs between the templates at a time to finish them, making all my ribs in two batches. With half the ribs sandwiched between my two finished templates,

and 1/8" dowels running through all, I sand the balsa ribs to the shape of the templates. When that is done, I am ready to cut in my spars notches. I have a Dremel and a Micro-Mark table saw, and both work well for this operation. Before I had the saws, I would cut them in using a Zona saw and assorted files to get them to the correct size. With a table saw, I make several passes adjusting a little at a time to get the correct notch width (see figure 14). I also use a cheap set of calipers to keep checking the notch size. When all the notches are cut, I am ready to repeat these steps to make the other batch of ribs.



Figure 12 the start of rib templates



Figure 13 drilling holes in roughed out balsa ribs



Figure 14 cutting notches for spars



Figure 15 making trailing edge



Figure 16 shows 3/8" balsa tips installed

While you can buy off the shelf trailing edge, I like to make my own (see figure 15). This allows me to make it at the correct angle to match my ribs and saves a lot of sanding later. I make my wing tip parts out of real light 3/8" balsa. This extra thickness

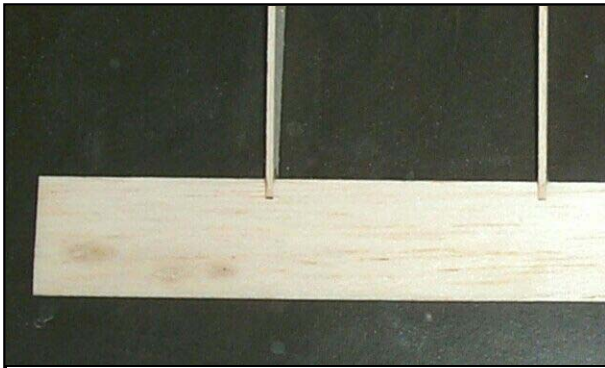


Figure 17 trailing edge is notched for ribs

may add a little weight, but makes the shape of the tip much better and makes it much easier to cover when completed (see figure 16). The tip is glued on flat, but the front of the trailing edge is

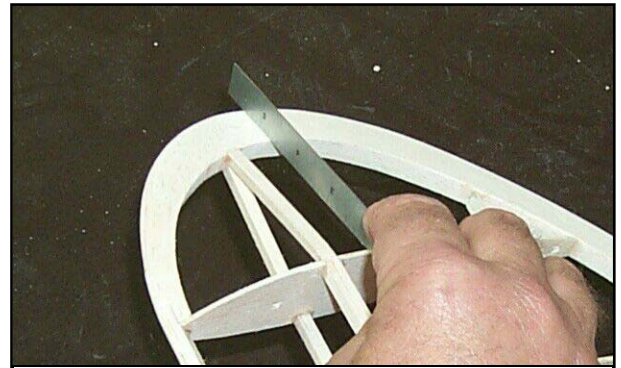


Figure 18 the 3/8" tips allow complete shaping

lifted to match the curvature of the rib which is not flat on the bottom. When the wing tips are glued to the wing, note that they are not flat on the plan, but are actually up in the air as they are lined up with the center of the leading edge and the center of the trailing edge. This is correct. When sanding the tip to shape (see figure 18) a useful tip is to put masking tape on the ribs so you don't accidentally start sanding them away. You use the ribs as a guide, but do not want to remove any material from them. Also note in figure 18 how the spars are cut and glued from the last rib to the tip.

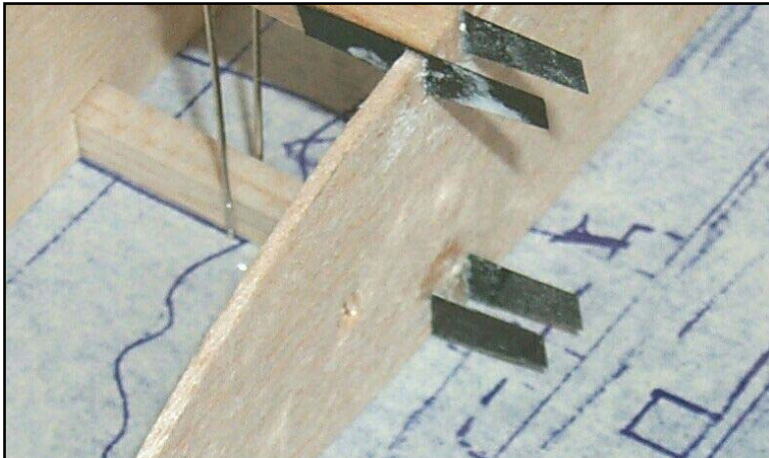


Figure 19 shows carbon fiber doublers for the spar joints

The wing's center ribs are cut down 1/16" on top and bottom. This area is to be sheeted with 1/16" medium weight balsa. In the last few years, I have been utilizing .007 unidirectional carbon fiber at my dihedral joints as doublers (see figure 19). I have had real good luck with this method and it is very light. Using plywood or hard balsa doublers will work okay too, but is a little heavier. The spars in the wing are picked and matched for weight. I try to use a medium weight of 8-12 pounds for the wing spars. It is important to match the weight and strength of the spars for the balance of the wing and for the longevity of it. While the wing does not have to be as strong as those on bigger and faster models, it does have to be strong enough to withstand the impact of dethermalizing.

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Figure 20 wing on my hinging dihedral jig

The Powerhouse has a flat center section, and both wing panels are attached at the appropriate angle and glued to the carbon doublers as well as in the butt-joint as shown in figure 19 and 20. I have made a special hinging board to set the dihedral joints. Not only does this allow me to set the angle correctly, it also ensures that the wing remains straight and that the wing panels are not sweeping forward or back. The jig is made with a piano hinge and 5/8" birch plywood (figure 20). I just use whatever is handy to space it up to the correct angle.

The Fuselage on the Powerhouse is a basic box frame construction. To get started, I weigh and find four medium/hard balsa longerons, 12-14 lb. wood. By matching the strength and weight of the longerons, the fuselage will build more uniform and will be strong. Balsa, weight and strength do tend to go hand-in-hand. If you did not take the time to match your longerons, the weakest will bend the easiest, and the strongest will try to go back to the natural straight shape. This will cause the fuselage to be shaped like a banana, which is not what we are looking for.

Pin down the longerons and start making your cross pieces. For this, I use my disc sander get the final size, and make two parts at a time so when I am ready to build



Figure 21 shows one fuselage side on plan, note calipers, scale & angle finder

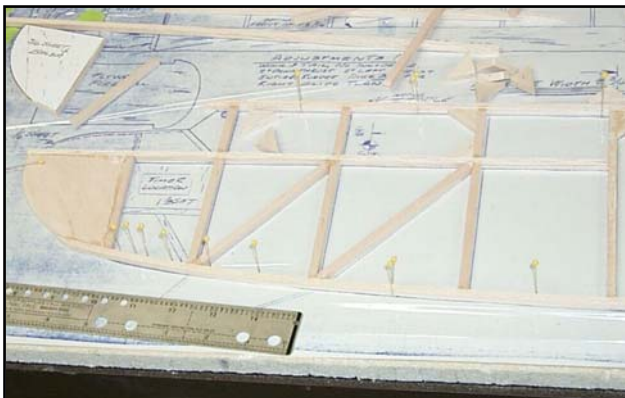


Figure 22 One side glued up

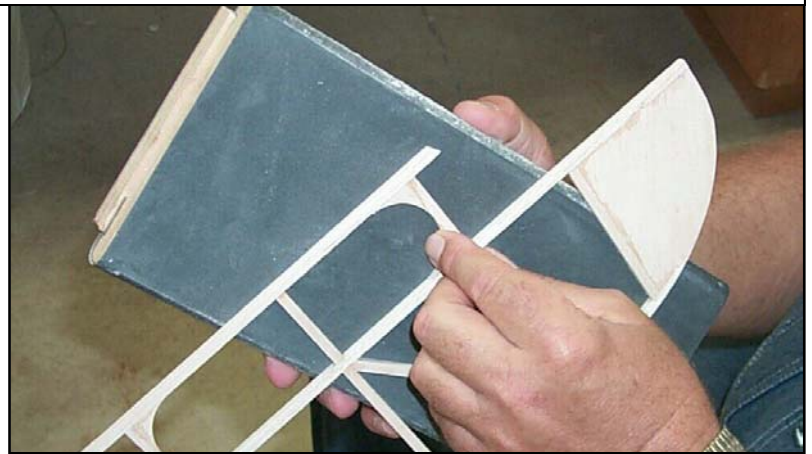


Figure 23 sanding both sides flat



Figure 24 sanding the corner of the windows round

the second half, I already have all the pieces made and they are exactly the same as the first side. Figure 21 shows my first side made and the extra corresponding part for the second side above the first side. I start making my cross pieces (diagonals) in the front where they are the longest. If I make a mistake and one gets too short, I simply use it for the next smallest part. The parts get smaller as you work towards the back. When all the diagonals are glued and the sheeting for the engine cheek is glued in place, I again lift the side off the plan and go over the joints with a little medium CA glue (see figure 22). Build the other side following the same steps and then sand both of the sides flat (see figure 23). I use a drum sander to sand the curves in the corner of the window frame (see figure 24). This makes for a nice looking curve, very

uniform. I sometimes will also make sanders, by wrapping sand paper around tubes for sanding similar inside radius.

The front of the cabin, where there is an upright, is a weak spot because the upright is bisected by the bottom outline of the window. To add strength in this area, I glue a piece of .007 thick unidirectional carbon fiber full height. This helps support the joint, and I have never had one break since using this method. You can also add another upright, full height, to the inside where the carbon is glued in figure 25. Remember you are making a left and right side, so be conscious to glue the support to the correct side on each fuselage side.

I am now ready to join the two halves. I start at the front

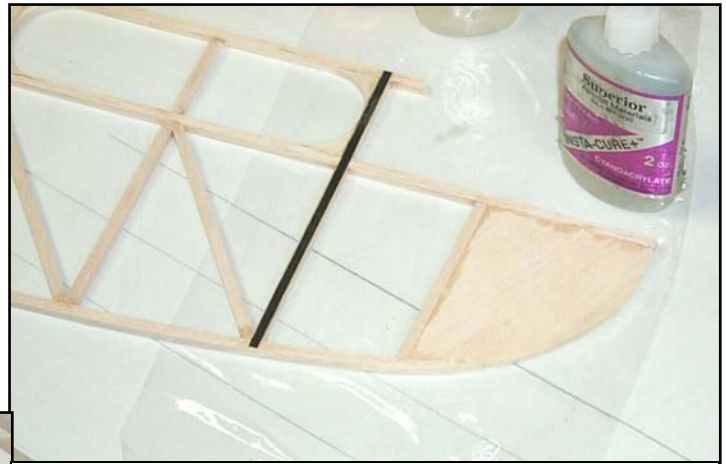


Figure 25 carbon fiber added for strength on upright



Figure 26 joining the two fuselage sides

where the fuselage cross pieces are all the same length and make eight parts exactly the same length. I tape one side to a square, so I am sure it is straight up and down. I weight the sides down to the plan using lead weights (see figure 26). This gets everything square, and perpendicular. I also do this right over a top view. The Powerhouse plan does actually have a top view, it just specifies a width. So, I draw a top view on the back side of the plan, starting with a center line.

With the sides rigged as shown in figure 26, I start gluing in the cross pieces. I glue in the bottom and the top cross pieces that I made earlier to the same length. After these

are glued in place a dry, I pull the sides together in the back and this creates a natural flowing curvature. I sand the inside of both sides a little at the back so they can be lined up and glued together. This is where the center line is very handy, as the back of the fuselage should line up exactly over the center line when glued together. This will ensure a straight fuselage. Then, I make the remaining cross pieces to fit the curvature created by gluing the two sides together at the back. Be sure you do not sand them too thin at the back, as this is where the dethermalizer and snuffer (tubing used to snuff out the dethermalizer fuse) tube will be added later.

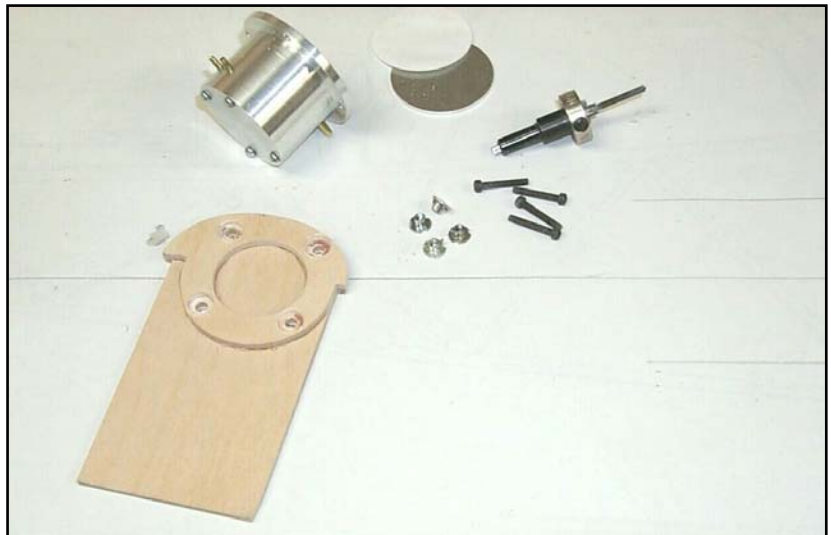


Figure 27 firewall, tank-mount, countersink, blind nuts

The firewall is made from 1/8" aircraft grade birch plywood. I use a modified countersink drill for the four 4 x 40 blind nuts placed in the firewall to mount my tank (see figure 27). This allows me to slightly countersink the blind nuts in and get good glue joint. I press the blind nuts in after using Super Seam (an adhesive used to attach covering to metal and wood on full size aircraft) as glue. When it is dry, I go over it again with another coat of Super Seam.

You want to be sure to get these glued in well, as you never want them to fall out. Super Seam can be purchased from Aircraft Spruce, 225 Airport Circle, Corona, California, 92882. Their phone number is 951-372-9555. They are a supplier for home-builts and general aviation. Note the ring I added in figure 27. This was done so the blind nuts did not protrude through the front of the firewall when glued in place. Also note, it is offset to the side, so the prop will be more

centered when we add left thrust. Before gluing the firewall in place, it is always a good idea to chase the threads with a 4 x 40 tap to make sure no glue got into the threads. Sal Taibi used to make the tank mounts like the one shown in figure 27, but no longer does. The current SAM rules allow for 15cc of fuel, but the rule cycle is due to be voted on again, and there is a movement to go to 8cc (the size of a stock Cox Texaco tank). It is beneficial to run a tank-mount as shown. It spaces the engine out to the proper location (without it, a spacer will have to be made to get the engine where it needs to be). Getting the engine in the proper location will really help with balancing your model as they almost always come out tail heavy. Cox engines have an o-ring in them that is in the middle of the tank. When the tank is full, the o-ring is submerged in fuel. When it gets down to a half tank, it starts to be surrounded by air. Many times, this will leak and cause your engine to lean and only run ½ the tank and the engine will stop.

I bend the landing gear and glue it up between balsa sheet wood. When completed, the sandwiched gear should line up with the fuselage uprights, where it can be secured well (see figure 28).

The hood (part that fits behind the engine is formed by wetting a piece of 1/16" balsa and taping it around a cylinder. I used a can of spray paint to wrap mine around, and secured it using masking tape until dry (see figure 29). By performing this part, it will take the bind out of it for fitting and is much less likely to crack later. I soak the wood in water, but some prefer to add a little ammonia to the water thinking it helps with the bending process. I have had good luck with just using water, and don't have to smell the ammonia. Either will work. When it is dry, I fit it and glue it to the fuselage. The nose block under the engine can be fit and glued on now using medium balsa. Make sure you can reach all the screws that hold the tank to the firewall. About the last thing to add is the sun visor. After shaping and sanding the nose cowl blow out the dust and fuel proof the inside area. I use slow drying epoxy thinned a little with lacquer thinner. A little thinner goes a long way. I mix and brush it on with an acid brush, being careful not to get any in the blind nuts. It may take a few days to dry. A warm climate or room helps. I then sand this area the best I can and brush on another coat. This makes a shiny and smooth fuel-proof engine area.

COVERING WITH POLY SPAN

I cover all my gas models with Polyspan as it is light and provides a strong, long-lasting finish. I also like how stable it is. Since it is a polyester base material, it is not affected by moisture like many of the other coverings, like silk, or tissue. Polyspan is excellent and helps you have that consistent model you are looking for, with no surprise warps

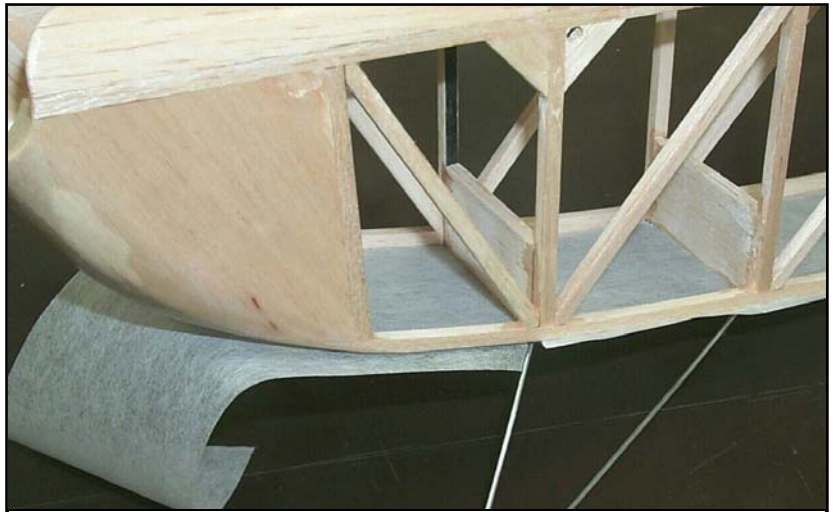


Figure 28 shows landing gear in place



Figure 29 the formed hood for the Powerhouse



Figure 30 brushing on sanding sealer

showing up. Polyspan has a smooth side and a rougher side, where the fibers stick up. It is very hard to see the difference, but the smooth side is a little shinier, and with careful inspection, you can see the fibers on the rough side. The smooth, shiny side goes out and is the finish side. As of now, the only color that Polyspan comes in is white (natural).

To prepare the surfaces to be covered, I make sure all are sanded smooth and are blown clean. I brush on a coat of lacquer sanding sealer (see figure 30) everywhere the covering will contact the structure. That means the top and bottom of ribs, all the perimeters, etc. I finish exclusively with nitrate dope, and have found the lacquer sanding sealer to be

compatible. If you plan to use an alternative finish, make sure everything is compatible by making a test panel. After my sanding sealer is dry, I sand all the surfaces with 220-320 grit paper and again blow the surface clean with compressed air. I then add a second coat of sanding sealer and sand it with 320 paper. You will notice the second coat will sand much easier and you will have a very smooth surface. Blow the dust off the structure.

There are a few products that can be used to attach the covering to the surface, but I have been using Fab Tac also available from Aircraft Spruce (contact information noted previously in this article). The Super Seam used to glue in the blind nuts works great too. I have found the Fab Tac works just as well as the Super Seam, and is about half the price. Both products need to be thinned a lot using Nitrate thinner to get to brushing consistency.

I brush on two coats of thinned Fab Tac over all the areas I used the lacquer sanding sealer on (where the covering will contact the framework). It dries fast, so you will have to work fast. Make sure to let it dry fully between coats. When both coats are dried, I make sure there are no defects in it like a run. If I find a defect, I lightly sand that area, and clean with compressed air. Now, I am ready to cover.

I usually start with the bottom of the stab. It is always correct to cover from the bottom to the top on all parts. The flat surfaces are very easy to do. Do not forget the fuzzy side goes towards the frame work, and the smooth side out. Cut your Polyspan larger than the area to be covered. You want extra material to hold onto around the perimeter if heating is necessary to get it smooth.



Figure 31 covering on wing tip, note wrinkles



Figure 32 covering attached to spar with Acetone

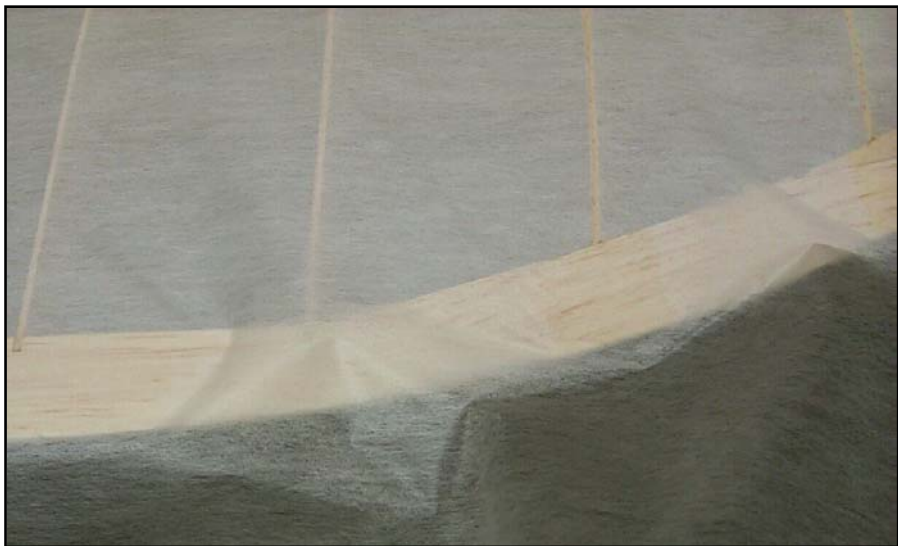


Figure 33 covering attached between wrinkles from extra covering



Figure 33 again shows wrinkle to be shrunk with heat

Polyspan can be stretched and shrunk with heat and will go around some severe compound curves. To attach the covering, lay it over the structure and use Acetone in a brush to activate the Fab Tac on the framework. By brushing the Acetone through the covering, it will soften and activate the Fab Tac, and will adhere quite quickly. Try to work out as many wrinkles as possible as you are attaching the Polyspan.

For purposes of showing the stretching and shrinking capability of Polyspan, I will show the top of the Powerhouse wing tip (figures 31-34). I attach the covering at the root, and then pull it and attach it down the spar (see figure 32). Because the tip is a compound curve, there is an excess of material when you start attaching it around the perimeter. The way I do this is to pull it and attach it in small sections, leaving the excess material in between several points where I attach it (see figure 33). I use a MonoKote heat gun to shrink the material between the points of attachment (see figure 34). Make sure you let the Acetone gas out before doing this (dry), or it will bubble the Fab Tac as the Acetone is heated. I go one wrinkle at a time, and after it is



Figure 34 I use a MonoKote heat gun to shrink out wrinkles



Figure 35 a completed wing tip shrunk and attached



Figure 36 sanding off the extra covering

shrunk down smooth, I attach it with Acetone. Now you can see why I cut the Polyspan oversize so I do not get burned when shrinking. One useful tip is to start shrinking the material outside the framework and work inward. By working one wrinkle at a time, I get a very nice finish on my compounding curves (see figure 35). I like to attach around the perimeter and shrink all the covering over the surface before attaching to the ribs. Make sure you stick it well to the bottom ribs, where there is under camber. Here, I will hold it against the camber with my fingers until the Acetone dries, which only takes a few seconds.

Also, make sure it is attached to the top of the ribs and all spars.

After the covering is attached to the perimeters, ribs, and spars, I roll up a piece of 320 wet-or-dry sandpaper and use it to trim off the excess covering (see figure 36). Make sure you have allowed adequate time for the Fab Tac and Acetone to dry before doing this.

Whenever Polyspan is lapped over itself, like at the dihedral joints of the wing, brush on two coats of Fab Tac over the first layer where it will be overlapped by the second layer. This will ensure a good positive joint, and the covering will not split away. I also use full strength Fab Tac or Super Seam to attach the rudder to the stab after both are covered. It makes a good joint as both glues are designed to glue fabric to wood or metal, so it is the best choice.

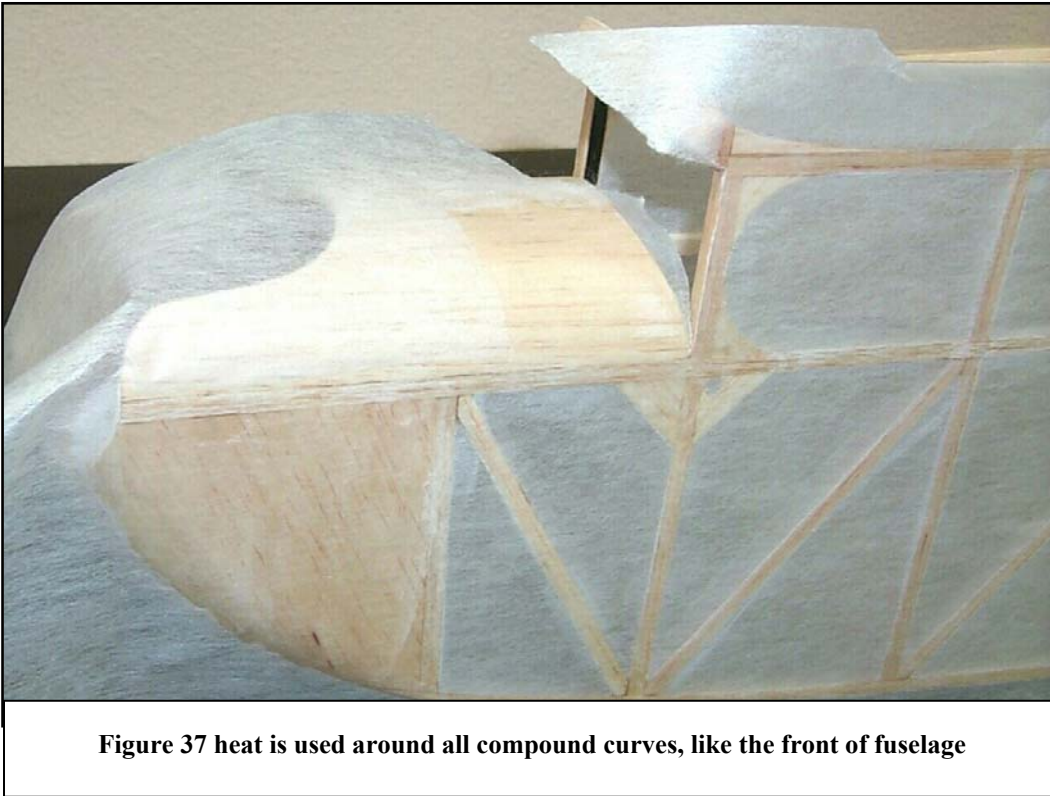


Figure 37 heat is used around all compound curves, like the front of fuselage

After finishing the wing covering, I drill a small hole through the center section sheeting (bottom) to vent the wing. Remember the holes in the ribs that were made during the scratch building process? Well now they act as vents and allow the wing to vent tip to tip. Without a vent, the wing would tend to blow up like a balloon when put in the sun at the flying field. Venting adds to the stability of the covering and it is much less-likely to warp by doing this. On the rudder and stab, I use a straight pin to poke small holes (on the bottom of stab, and one side of rudder) in the corners of the structure to vent them as well. Like I said, this is a very important step in the

covering process. Remember, heat can be used to stretch and shrink Polyspan, and the heat will help you achieve a good covering job over all compound surfaces (see Figure 37).

Applying the Nitrate Dope

When all the covering is attached and shrunk tight with a heat gun, I am ready to apply my nitrate dope. There are two types of Nitrate dope, standard (tautening) which means it draws tight as it cures, and non-tautening which does not draw as it cures. Be cautious in using too much standard dope especially on a light structure where it can actually cause crushing and severe distortion. Most dopes are thinned 50/50 with nitrate thinner to get a good brushing consistency. I use a specific brand of foam brush to apply the dope, a 3" wide Jen (brand name is Jen) brush. It says not for use with lacquers, but works great as long as the entire brush is not submerged in the thinned dope. I only wet about the last 1" – 1 1/4" of the brush in the dope.

I start by applying a coat of standard (tautening) dope over the entire covered area. This helps keep the covering tight. I then put a second coat of standard on the bottom of the wing. The wing and stab tend to want to warp up, as the airfoil acts a truss, and pulls against the bottom which is flat or near flat. When completed, I apply 4-5 coats of clear nitrate. On the bottom of the stab, I use all standard nitrate. All the other coats, except those noted, are done with non-tautening. I move the brush slowly, and do not apply a lot of pressure. Remember, you are trying to apply the dope, not squeeze a bunch through the covering. This will only add unnecessary weight. As you start getting dope built up, you may notice the brush grabbing on the leading edge

and trailing edge. If this happens, you can sand those areas with 400 sandpaper. DO NOT sand the Polyspan between coats, as it will only pull fibers up and mess up the finish. After your 4-5 coats of dope are applied, you can very lightly sand the surface if you want but it is not necessary. If you want to put your AMA number or other decorative tissue on your model, apply it after 3 coats of dope, and put at least 3 coats over the top of your tissue to seal it as well.

I cut my letters from Japanese tissue. I use 3M fine Line tape as a reference and hold them in place with a pair of tweezers and spray them with water, one at a time. Now final position it and blot out as much water as possible with a paper towel. As soon as I am finished blotting, I start brushing on a little acetone. The acetone keeps the letter locked down until water evaporates. Keep it acetone wet until all of the water has evaporated. Repeat this process with all your letters. As you become more proficient, you can start doing several letters at a time. The Powerhouse decals on the side of the fuselage were scanned from an old article and made on the computer.

Wire Fittings and dowels

Some hardware is necessary now, like the wing and stabilizer keys, the dethermalizer hooks, and the snuffer tube (See figure 38). The two wires with the large radius are for the top of the stab, and the large radius is intentional to get more leverage to pop up the stab in dethermalizer mode. The other two wires go on the back of the stab and the back of the fuselage. This is where I wrap a rubber band around the dethermalizer fuse. The snuffer tube also goes in the back of the fuselage, between the two wires. The wing and stab keys are made from 1/2 round made from dowel. I like to round the ends also as I think it looks better. I glue the wires and alignment keys with Fab Tac, at near full strength.

Now cut the 3/16" dowels the rubber bands loop around to hold the wing and stab to the fuselage. They should stick out of the fuselage about 5/8" on each side. Make sure your wing is square before gluing the keys on. Put the wing on with some #64 rubber bands, and measure from the tail to a spot on the wing tip on both sides. If the measurements are the same, the wing the wing should be square to the fuselage and you can glue on your keys. Next, glue the four dowels to the bottom of the stab (with stab installed). Don't forget, the rudder is supposed to be offset for glide turn.

Now for the Paint

I really like the looks of the Powerhouse paint scheme, and have followed it on each of them I have built. To get nice sharp lines, I mask the paint scheme with 3M Scotch Fine Line (a tan colored product). It is available in many widths, conforms to sharp corners, and sticks well. It is very good to stop bleed under, where paint bleeds under the tape, and leaves a soft edge. After I have the outline of the paint scheme down with Fine Line, I use newspaper and 3M 233+ (green) masking tape to cover the areas I do not want painted (refer to figures 39 and 40). Both products were developed for the automotive paint industry and are resistant to chemicals like thinner and most types of paint. If you use the wrong type of masking tape, you will run the risk of it lifting as soon as the paint hits it, or maybe worse, the adhesive being attacked and becoming a permanent part of your model by not being able to peel it off! In any case, I have found the

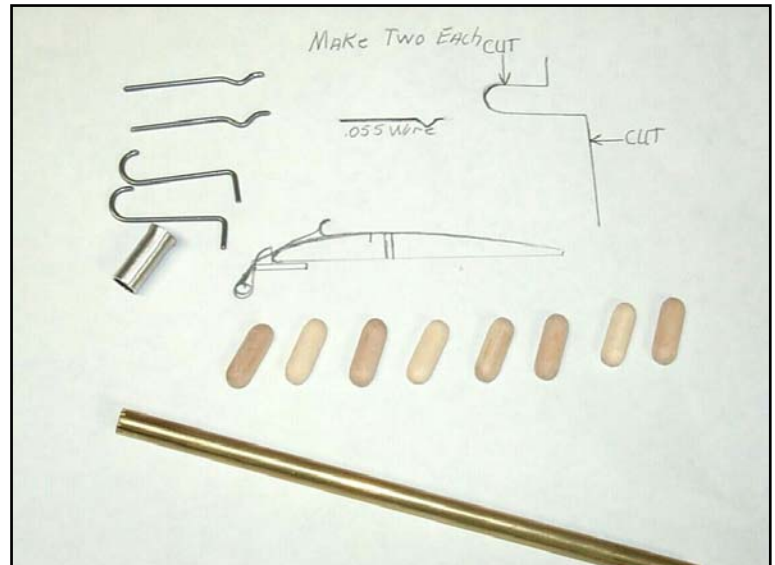


Figure 38 shows the dethermalizer hooks, wing keys and snuffer tube. Also, I make a hole-saw out of brass tube to drill wing hold-down dowel holes



Figure 39 one side of fuselage masked as described with 3M Fine Line and 3M Scotch 233+ masking tape. Works great!

233+ to be the best masking tape available. These 3M masking products can be purchased from any automotive paint supplier. A tip on using the newspaper is to use two layers in case there is an imperfection. This will eliminate paint getting where you do not want it. Also note, one side always has small holes used in the printing process so be sure to tape over them, or not use that side where possible. After everything is masked and before painting, I always rub down the edges good before applying color.

Colored Nitrate is almost impossible to get. The one source for colored Nitrate is Aerodyne (Allen Heinrich) whose contact information was listed earlier in this article. He sells a good selection, with white, black, red, yellow, cream and blue among other colors. His colors are opaque and cover quite quickly. Many times, I am after a translucent look, and have had excellent luck mixing House of Kolor (another automotive paint product) Kandy Koncentrate with thinned clear dope. When I mix my colored dope, I always use non-tautening dope, thinned to spray consistency with Nitrate thinner. House of Kolor offers a good selection of colors, and I like red, pagan gold and tangerine a lot. A small quantity (about 1 ounce) of Kandy Koncentrate will color enough dope to spray a good size model.

I spray on a couple light coats using a cheap touch up gun. Since the color intensity builds with more coats of paint, putting it on even is important. It helps to spray each coat in perpendicular directions, called cross coating. We spray with 50-60 pounds of air pressure. For this model, I mixed up a maroon in clear non-tautening dope. When stripping the masking, it helps to pull it back against itself to keep the sharp edge. After painting and stripping masking, it is ready to be fuel proofed, which will protect your new paint job from being attacked by fuel with nitro content.

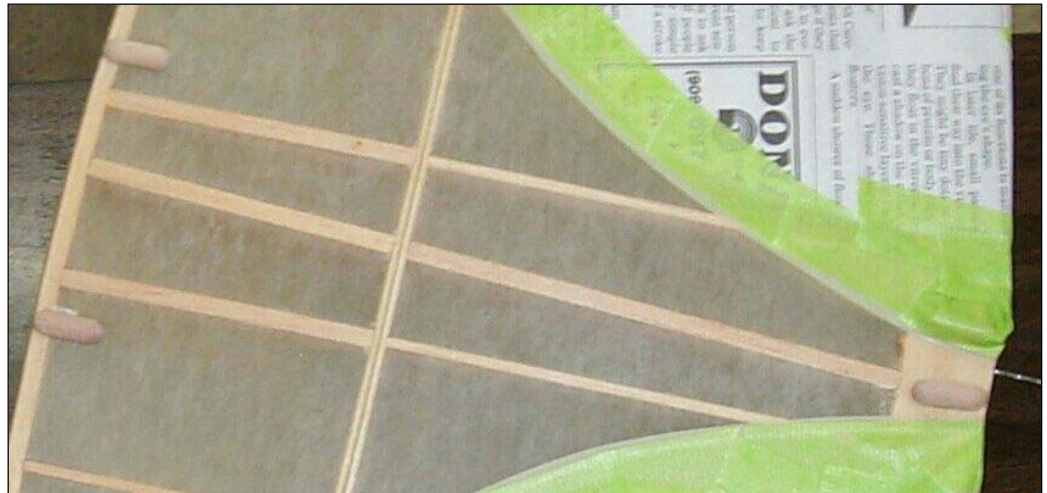


Figure 40 Fine Line and 233+ masking used on the stab as described. Note the rudder offset and how the paint scheme is also offset to match



Figure 41 Masking is stripped after nitrate dried, ready for fuel proofing

Fuel Proofing

I have used a product called Fullerplast, developed by Fuller O'Brien paint products as a bar top finish. It works great for fuel proofing model airplanes. I used to be able to buy it locally, but more recently, have had to order it on the internet from Van Dee at <http://www.van-dee.com/clear.htm> It is a 2-part product, with a clear and a catalyst, mixed in a 16:1 ratio. Fullerplast comes in two forms Gloss and Satin. Both work and it comes down to personal taste. I actually use

both, and on some of the old timer models think the Satin makes it look more period correct. That is what I will use on this model. I use a digital scale, and mix my 16:1 ratio of the Fullerplast by weight. It is ready to shoot when mixed, and no thinning is necessary. I shoot one heavy coat of Fullerplast using 60 pounds of air pressure and the same cheap touch up gun I use to paint with. The stuff is really sticky, but can be cleaned up with Lacquer thinner. It dries kind of slow, so be sure to not shoot it too heavy or it will run. I would suggest shooting a test panel before trying it on your first model. I have found that I can store any left-over Fullerplast in a glass jar in my freezer for up to 9 months, so you do not have a lot of waste. The cold temperature cancels out the chemical reaction. Before using it the next time, just let it come up to room temperature, as it gets thick when cold.

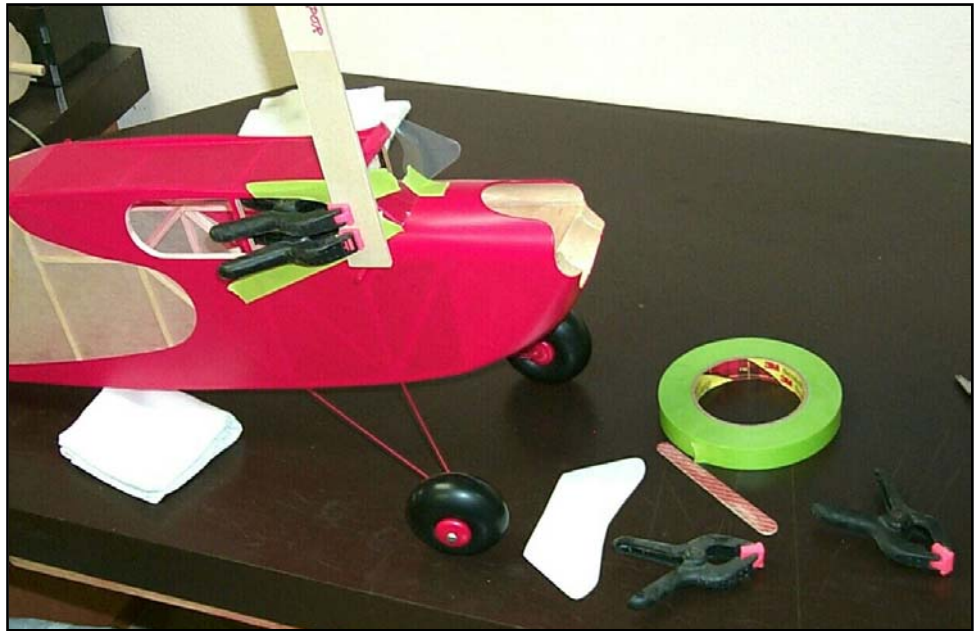


Figure 42 one side of windshield glued and drying. Note paper windshield pattern in foreground

Installing Windows

For the windshield pattern, I fold a piece of paper in half and use the S.W.A.G. (Scientific Wild A** Guess) method until I get a pattern that fits the fuselage. This may take a couple tries. When the pattern is made, I lay it on a piece of .016 Butyrate plastic and trace around the outside edge. I use a pencil that is made to write on almost anything, paper, glass, plastic and metal. The brand is Stabilo and it is part number 8008. I bought mine from a stationery store. Cut to the line and test fit the window to make sure it fits right. The side window patterns are easy to make by using the fuselage as a guide.

I use Formula 560 canopy glue to install the windows. I don't think anyone likes installing the windows, but patience and learning technique will yield a good installation. The glue is white when applied, and dries clear. Do not get in a hurry to remove clamps and tape, as it takes a while for the glue to cure completely (refer to figure 42). For flat windows like the side windows on the Powerhouse, I lay down a small bead of glue and set the window into place. Make sure you have the fuselage lying flat so the Butyrate plastic will not slide out of place. Be careful when you set the plastic that it is in place, and you don't smear the glue.



Figure 43 side window is set in place over a small bead of Formula 560 glue. Set in place to avoid smearing glue

Finishing Up

I install the #8 Trexler tires by soldering on a small washer on the outside of the wood hub (see figure 42). Glue in the dethermalizer fuse snuffer tube and the hooks in the back of the stabilizer and fuselage (Use Fab Tac glue). When I bolt the engine in, I like to use a small amount of blue Loctite on the threads so the screws will not vibrate loose. The thrust

on the Powerhouse is about 3 degrees of left, and about 3 degrees of down. This will induce a left hand climb, and overcome the right offset in the rudder. The desired flight is left hand climb, and right hand glide. I like this pattern because you can tell when the engine shuts off as it switches from left hand to right hand. On a 15cc flight, they will run about 13 minutes under power, and it will be VERY high. The last step is to check for warps and trim. I try to have my stabilizer flat, and store it on a 2" thick Styrofoam board (rubber Banded to it). This will help keep it flat, and is light, so if you drop it by mistake, it will not break. Some guys use wooden boards for the same purpose, but you can imagine what would happen if you accidentally dropped it with the weight of a board attached to it. On the wing, I like to wash-out both tips. That means, looking from the back of the wing, the trailing edge is lifted about 3/16". This adds a lot of stability to the flying. The desired wash-out can be induced by again heating the Polyspan covering with the MonoKote heat gun and holding pressure to twist the desired warps into the wing or stab.

I keep a notebook with all of my models and their trim specs. It is an excellent reference, especially if a model requires repair and you want to know how it was set up. I update the trim notes as I make changes to the model. The trim sheet for my 1/2 A Powerhouse is shown on the next page. It will give you an idea of the things I keep track of.

I buy all my fuel from Aerodyne as they offer an excellent selection of fuels. I have found on hotter days, I can run less nitro (5-10%) than on colder days which requires higher nitro to keep the wick lit! On cold days, I use 25% nitro fuel. There is an advantage to running the lowest nitro possible. It is more economical and will net a longer engine run.

This is a great beginner free flight model. If you are a raw rookie, it is always advisable to get help with your early flights. That is how most of us learned to fly. I was lucky enough to join the SCAMPS and the Perris group of flyers, and learned a lot of what I know from Sal Taibi. I do not think anyone has taught more modelers to fly than Sal. I thank him for everything he has meant to me. When someone is helping trim your model and suggest changes, have them explain why they think it needs these changes. That is a method to learn.

I hope this article has enticed you to build a 1/2 Texaco Powerhouse. If it has, you will be building a fun airplane, and when it is all set up, will make a fun competition model too. Texaco and 1/2 A Texaco are my two favorite events to fly and I have had more fun flying these events than any others. Good luck and get ready to have an excellent flying, competitive free flight model.

Suppliers and References

Aerodyne – fuel, paint, general free flight supplies
17244 Darwin, Unit C
Hesperia, California 92345.
Phone (760) 956-2949
E-mail is AerodyneAl@aol.com

SCAMPS Southern California Antique Model Plane Society – Southern California flying club

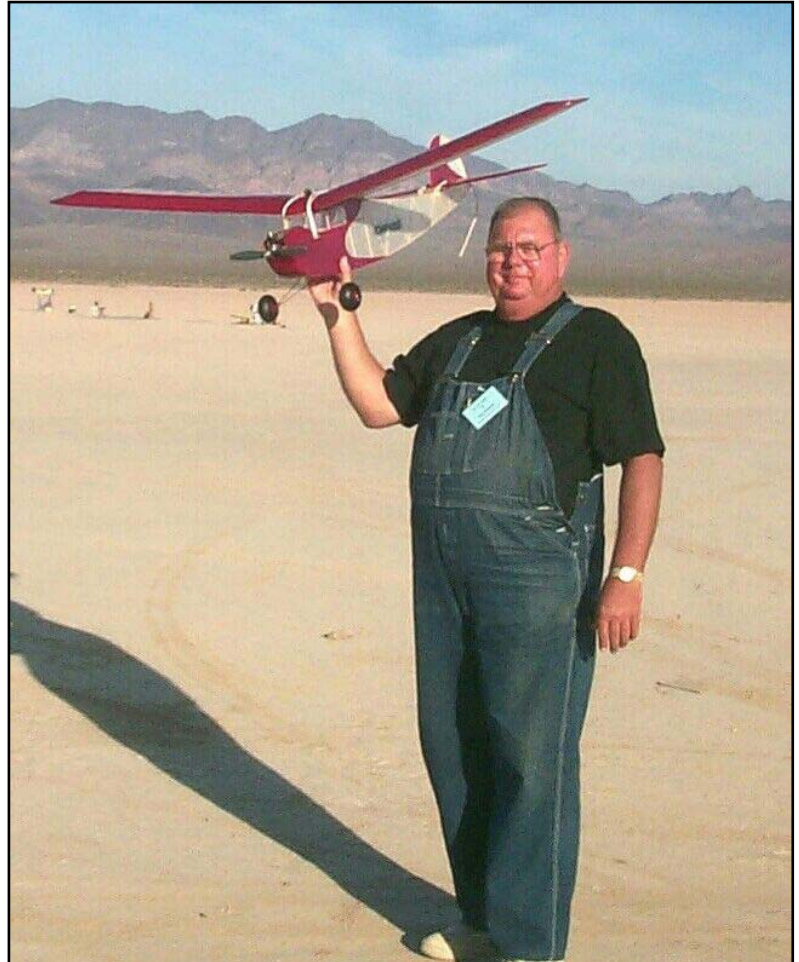


Figure 44 Ready to make a flight at the SAM Champs, Henderson Nevada. Note the long fuse hanging from back of model.

Good luck and get ready to have an excellent flying, competitive free flight model.

Web Site <http://scamps.homestead.com/>

SAM Society of Antique Modelers – Governing body for old timer free flight

Web Site: <http://www.antiquemodeler.org/index2.html>

Aerospace Composite Products – Carbon fiber supplies

Web Site: <http://www.acp-composites.com/ACP-CAT.HTM>

Van Dee – supplier of Fullerplast for fuel proofing

Web Site: <http://www.van-dee.com/clear.htm>

Gene Wallock – Sam Librarian where you can order a copy of the original build article (for full size Powerhouse)

13 Sandy Trail Lane

Lawton, Oklahoma 73505

Aircraft Spruce, 225 Airport Circle, Corona, California, 92882

E-mail: Velinak@sbcglobal.net

Aircraft Spruce – supplier of adhesives used for gluing and covering and general aviation supplies

225 Airport Circle

Corona, California, 92882

Web Site: <http://www.aircraftspruce.com/>

Larry Davidson – general free flight model supplies including Polyspan

66 Casa Mia Circle

Moneta, Virginia 24121

E-mail: samchamp@jetbroadband.com

Gary Sherman

1521 S. Normandy Terrace

Corona, California 92882

E-mail: GaryS80825@aol.com

After completing this model, I won the ½ A Texaco event with it at the 2005 at the SAM Champs, Henderson, Nevada. My three flight total was almost 74 minutes and lots of fun, and lots of chasing!

My ½ A Specifications sheet below

½ A Texaco Specifications Sheet



Class: ½ A Texaco

Model Design: Sal Taibi's Powerhouse

Engine: Cox Texaco .049

Thrust: 4 degrees of left, 2 degrees of down

Propeller: Cox Grey 8 x 4 Texaco Prop

RPM: 7,200

Fuel: Aerodyne Custom 100 (10% Nitro)

Weight: 19 ounces

Wing Area: 540 sq/in.

Wing Loading: 5.06 ounces/square foot

CG: 5 1/2" Behind Leading Edge

Incidence: 2 degrees

Trim in Wing: 3/16" wash-out both wingtips

Stab Tilt: none

Rudder Tab: none

Flight Pattern: Left/Right

Special Notes: Model runs about 13 minutes on 15cc of fuel. Use Custom 250 fuel on cold days, Custom 100 on warm days.