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Boeing 757 EDF



Construction

C/L Encore 50

F/F D.H. 82 Tiger Moth

PRINTED IN THE U.S.A.



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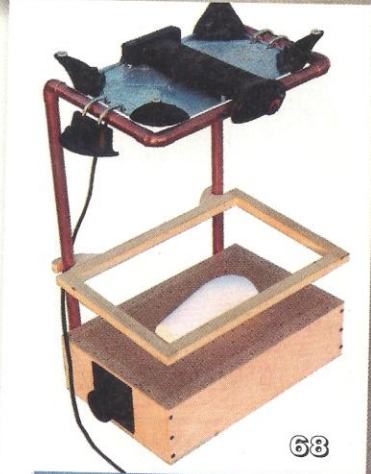
Brodak

Fly-In

2007

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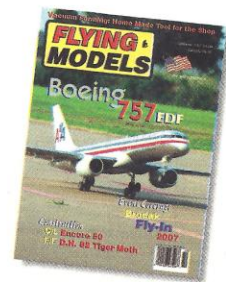
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On the Cover: V₁... V_R... Rotate! Positive rate of climb! Keith Sparks' magnificent Boeing 757, powered by two electric ducted fans, rises majestically from the runway. This scale model is constructed completely from foam. **Photo: Ron Pope**



Encore 50

Latest in a long line of his Stunt designs, the author's C/L ship was designed to have no quirks and use a .51-.60 2-stroke engine.

By Allen Brickhaus

The *Encore* is a further continuation of my *Buccaneer*, *Scepter*, *Mr. Brickhaus's OPUS* and *Legacy* series. With his permission, I based the *Buccaneer* series on Bob Hunt's *Genesis* model. The *Buccaneer III* was the first foam wing bird I built and was started with a foam wing donated by Bob Hunt and CSC Products that I won in 1976. I outscored all the Intermediate flyers at the Muscular Dystrophy contest held at the Wurlitzer Factory in DeKalb, IL on the Labor Day weekend of 1976.

Buccaneers one through three were all Fox 35 powered and the *Buccaneer III* is what Tom Dixon would entitle a "Nostalgia" legal model. The design is now over twenty-five years old. I still have the rudder section and might reprise the design for Tom's contest.



PHOTOGRAPHY: ALLEN BRICKHAUS

One of the very neat techniques used to apply the color trim was the application of gold leaf to the nose and tail of the *Encore 50*. Mike Schmitt helped Allen out by building the prototype for him.

The *Buccaneers* worked their way up to 650 square inches and were eventually powered by the venerable ST .46. It also went through the double kitting process by Bill and Karen Hopkins of Custom Models and now by Ultra Hobby Products. Both are Dallas area based firms with the Hopkins version being foam wings and the UHP series being built up wood wings. Both companies furnished a 740- and a 746-size.

I moved away from the *Buccaneers* for a while with muffled and piped versions of the *Envoy* series. The number VI piped version is still being flown. I moved back to the *Buccaneer/Genesis* design with the *Scepter*. That developed into the *Mr. Brickhaus's OPUS* published in *Aviation Modeler International* of England and then on to the *Legacy* kit by John Brodak. The *Encore* is a further refinement of downsizing to the 665-square inch size, adding a turtle deck and setting up the *Encore* for some form of muffled two-stroke, muffled four-stroke or piped two-stroke .50 engines.

The *Encore* is a package designed to give the pilot no quirks. It is a simple but nicely shaped model with the aesthetic appearance of a more classic shaped Stunter. The surface shapes offer the builder a blank canvas on to which a beautiful painted masterpiece can be unveiled to the audience at the local or National circle gallery. Put on your Leonardo hat and bring out your own "Mona Lisa".

Michael "Leonardo" Schmitt graciously accepted the challenge to bring the first *Encore* to the light of the flying circle. He has also brought a finishing technique not seen often in modeling, but one that has been utilized in the art guild for many years. Sina Goudarzi helped him with a paint scheme that added the use of gold leaf to the model pallet. Note how Michael used the gold leaf on the nose, flying surface tips and the rudder. Plenty of thanks to him for bringing the *Encore* to life.

Now to the bench

Wing: Count your ribs and select the heavier of each numbered rib to serve on the outboard wing panel. Use your favorite choice of wing jigs and cut all "rod" holes to match the needs of your jig. Measure the distances between the ribs on both the inboard and the outboard panels. A template to adjust the distance between the ribs can be made from the cardboard you get from the back of letter or legal note pads (the yellow stuff type). This template provides the exact distance between ribs you need to properly assemble the ribs in their appropriate locations.

Set the wing up in a jig, being sure that the table surface is perfectly flat and the jig is shimmed straight as well. Carefully push the ribs over the rods and begin setting the wing panel rib locations. All ribs must smoothly move over the rods without causing a bind in the system. You do not want to build in a tensioned area in the wing that might cause it to warp when removing it from the jig.

Start pinning the leading edge, trailing edge and spars to the ribs. Work the fits between parts as to again not add any tension to the individual fits at this point. When you are satisfied with the fit, you may use some thin cyano and deftly spot glue the wing parts together at all joints. The CyA is used to bond the parts but not add a lot of weight.

Recheck and realign any deviations in this basic structure. When satisfied, thin your favorite aliphatic glue with water, 50/50, and brush the thinned glue to all wing joints at this time. The thinned glue adds strength with little weight gain.

Bush the bellcrank at the leadout positions with annealed brass tubing, slid tightly over the Sullivan .018-inch wire. The tubing should be cut to at least a 1½-inch length. Drill the bellcrank extremities to fit the o.d. of the brass tubing. The brass tubing's final shape is similar to a "doghouse" laid on its side. The short, but flat base of the "doghouse" runs through the bellcrank at their pivot points fore and aft of the center.

AT A GLANCE

Type:	C/L Stunt
Construction:	balsa and plywood
Wing span:	59½ inches
Wing area:	665 sq. in.
Airfoil:	18% symmetrical
Length:	43¼ inches
Weight:	58 oz.
Wing loading:	12.6 oz./sq.ft.
Engine required:	.50-.61 2-stroke
Prop:	12-3.9 Bolly
Line diameter/length:	.018/63½ feet

Once the wire is wrapped to AMA specs, five-minute epoxy is spread over the wire. Your bellcrank already has the music wire pivot installed. Dry fit the pivot wire and the upper and lower balsa spar doublers in the wing as shown on the plans. Brace and glue the spar doublers to the rear sections of the current spars.

Bush the holes needed for pushrod locations on the flap horn. The bushing should be the inside diameter of the pushrod from the bellcrank and the outside diameter of the holes in the flap vertical ear of the flap horn. The holes in the vertical portion might have to be drilled out to fit the bushing.

Add the flap pushrod at this time. Do not set the vertical height of the bellcrank in place until you are ready for the bellcrank-to-flap horn connection. Allow the pivot wire to be a tight fit, but as yet unglued until the

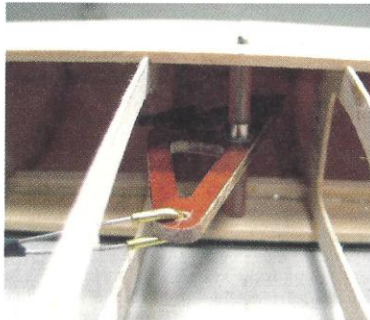


The *Encore* begins to take its final shape. Instead of the classic dope finish, Michael chose to use Ultracote, and at this point has covered the wing with it after installing leadouts and bellcrank first.

Encore 50



The basic wing platform has been assembled (at left) but little glue has been added. This is the time to tack-glue the parts, only after you are satisfied with the precise fit and alignment of all of them. The bellcrank (below center) is installed in the wing temporarily. Allen always finds a way of determining whether the bellcrank is at perfect neutral when the wing is closed up and installed in the fuselage. Mark your pushrods or leadout guides. The finished wing tip weight box (below right) is displayed in all its glory. It is best to build the box to a size that will carry as much as two ounces of tip weight, although that amount might be more than what you need. Allen prefers having the extra capacity rather than less space for what you need.



flap connection. This allows you to slide the bellcrank up or down to allow the best possible smooth fit with the juncture.

Sand the structure at this point with a very long and flat sanding block to which 220-grit sandpaper has been glued to the sanding surface. Once satisfied with the fit of all the current parts, begin to add all wing sheeting. Start on the bottom first so you can improve the wood sheeting fits when moving to the upper surface. Please note the curved edge shapes of the center sheeting at each third rib out from the center of the wing.

Now properly cut to fit and carefully glue all cap strips at each appropriate rib location. Install the wing tip weight box so the open cap area is available on the bottom side of the outboard wing.

Tack-glue the wing tips in place, shape and remove. Follow the blocks and install the inboard wing tip leadout guide as shown on the plans. Place the leadouts through the leadout guide and re-glue both tips back in

place. Final sand all surfaces and go to the next part of construction.

Flaps: Note the side profiles of the flaps as depicted on the plans. The flaps are shaped in this manner by using three pieces of music wire of three different diameters. Place a $\frac{3}{8}$ -inch wire at the leading edge of the flaps and a $\frac{1}{4}$ -inch wire at the trailing edge. Note that the grain is parallel to the trailing edge, not the leading edge. Hold the two wires and the flap wood with one hand. With the other hand, sand the flaps with almost no pressure, using a sanding block with 80-grit paper installed. Work the sanding block in a fore and aft direction with only enough pressure to achieve the basic shape needed. Now replace the trailing edge wire with one of a $\frac{1}{8}$ -inch diameter, turn the flap over, and re-sand the other side.

The final goal is to have an equally tapered flap shape. Re-sand the flaps with 220-grit paper. Note the location of the hinges and the flap horn leg insert. Install the flap horn

leg insert and sand smooth. Cut the flap hinge slots as noted on the plans.

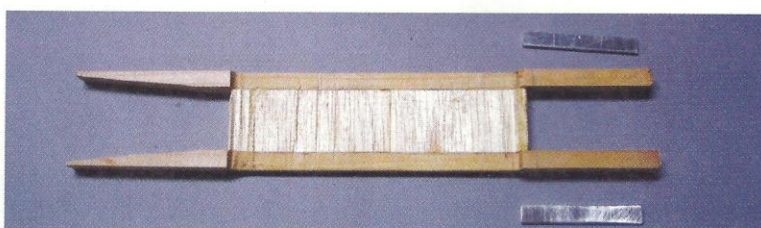
The plans will show a permanent inboard flap tip installed and an adjustable outboard flap tip hinged at the outer extremity. This setup follows currently accepted thoughts of allowing the outer tip adjuster to help level the wing without upsetting the flap and elevator connections.

If you prefer a full-length flap to compensate for a possible higher finished weight, you can still use full-length flaps on both wing panels. Install the flaps horn and dry fit the flaps, with hinges, to the wing. Adjust the bellcrank and flap neutral and connect the flap pushrod to the horn.

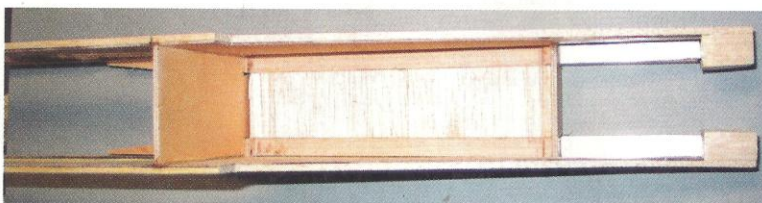
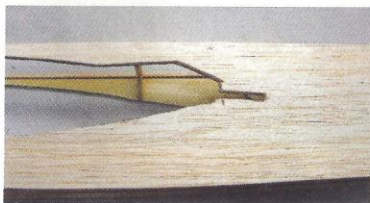
Stab and elevators: Lay wax paper over the plans of the stab and elevators. Be sure you have a surface to which the parts can be pinned to shapes drawn on the paper. Begin to fit the kit wood parts of the stab over the plans and commence to glue the basic structure together. Insert and glue in the ribs to



The fuselage sides are being laminated (above left) with slow curing epoxy and carbon fiber matt. This layup must be compressed over a flat surface to render a straight fuselage later in the building stage. The completed fuselage engine crutch (above right) as finished is shown here. Proper alignment of parts here really makes the flying trim portion of the first flights smoother. Now the slot is cut (below



left) at the trailing edge of the wing cutout in the fuselage to allow the flap horn to be placed inside the fuselage. This allows the horn to be tied to the trailing edge of the wing and offers a safer installation. The crutch (below right) is then glued firmly between the fuselage sides. Slow curing epoxy is recommended to provide time to ensure that the pieces are in perfect alignment.



the outline. Each individual rib is cut from stock and fitted in place.

The elevators are shaped in a similar fashion as the flaps were done earlier. Work the outline and taper in the flaps to simulate those shown on the plans. As with the wing and flaps, dry fit the elevators to the stab with individual hinges and the elevator horn. When satisfied with the basic structure, sand the parts with a straight sanding block fitted with 220-grit sandpaper.

Rudder: Glue together the vertical rudder parts and sand the parts. I work some of the airfoil into the rudder so that the inboard side is flat and the outboard section has some curvature. I wait to do the final shaping until the rudder is fitted to the fuselage. Set aside the rudder until later.

Fuselage construction

Sort out the vertical fuselage formers at Sections A and B. It is highly recommended to undercut the motor mounts $\frac{1}{4}$ inch between Sections A and B. This allows the very popular plastic type fuel tanks to be inserted in the structure at flying time. The extra $\frac{1}{4}$ inch removed from the mounts allows the plastic tanks to be shimmed high enough to trim the inside and outside maneuver speeds equally.

Note the motor mount rounded cuts to the aft of Section A and to the front of Section B. This relieves stress points in the undercut motor mounts. Even if you decide to use metal tanks, they can be shimmed down enough to alter the motor run for equal maneuver speeds. A decision should be made at this time to utilize a muffled or piped motor.



The rear fuselage is held steady in Byron Barker's (C.F. Slattery) fuselage jig. He can be reached at either 812-944-8511 or 812-948-9167 to purchase this precision tool.

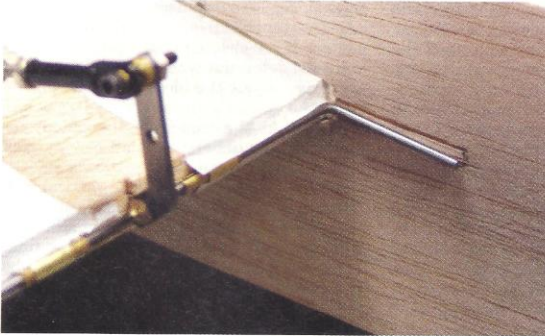
The opening in Section B should remain as is if you use a pipe. The opening should be filled in if you are using a muffled motor. Also the entire bottom block will close off the fuselage with the muffled motor.

Drill, glue and screw the $\frac{1}{8}$ -inch aluminum motor mount pads to the wood mounts. Fit the Section A and B formers to the mounts and hold together with your favorite wood clamps. Be sure all is straight and remove from the clamps. Add an appropriate amount of slow curing epoxy to the joint areas, re-install in the clamps and allow the epoxy to set up.

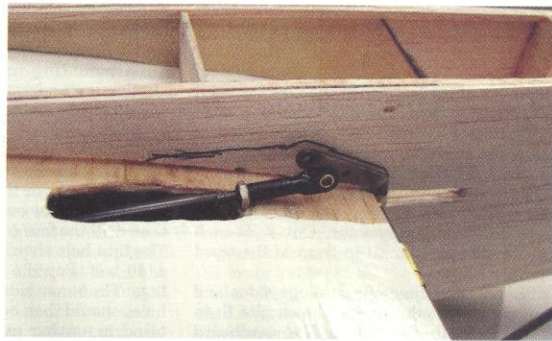
Glue in the cross-grained balsa in between

the motor mounts now with water-based glues. Allow drying. Also add the tank mounting plate located just above the pipe tunnel access hole in Section B. Place the chosen motor in the appropriate location and drill the motor mount holes so the motor has about a one degree offset. Just make sure that the motor does not have an inboard offset.

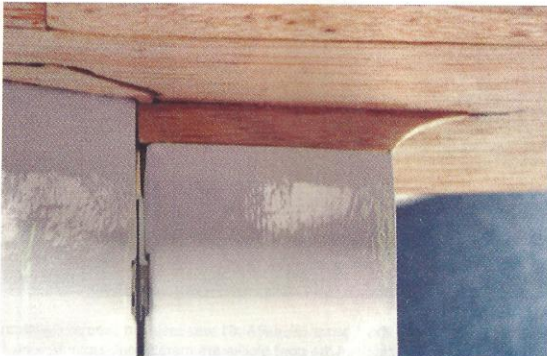
Assemble the fuselage sides and plywood doublers with a slow drying epoxy and clamp to assure that the parts do not move during the curing process. You only need enough epoxy to accomplish the goal. Add the stab fuselage balsa doublers under the stab location as shown on the plans. When



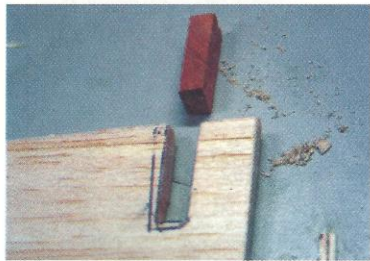
One last check to make sure the bearing tubes for the flap torque rod are firmly glued to the wing trailing edge (above left). First slide the wing, with torque rod level, through the slot. Pull the flap horn as far forward as possible (above right) and outline the clearance cutout necessary to slide the horn into the fuse-



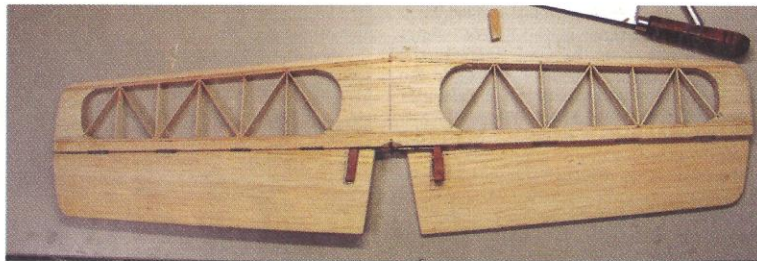
lage. Fillets (below left) were used to soften the lines of the wing to flap to fuselage joint. The Hangar 9 Ultracote (below right) can readily stretch around curved sections of the wing tip. Practice with different settings on your iron, as the dial heat indicators are often not similar on various brands of irons.



Encore 50



A hardwood piece is inserted in each elevator (above left) in order to strengthen the bearing surface for the elevator torque link. The hardwood eliminates the



compression in softer balsa that leads to sloppy controls. Overall view of the entire stab and elevator (above right) surfaces while still on the building board.

those parts are done you are ready to join the sides to the basic motor mount crutch.

A fuselage jig is recommended but a very straight line drawn on a pinning board can do the job if you are careful. Align the center of Section A and B with the straight centerline drawn on your building board. Place wax paper above the line or plans or the building board so glue will not attach the fuse structure to the lower surface.

Begin at the point behind Section B and begin to pin the formers to the fuse while being sure the formers are centered over the lower planform. Work from the front to the back and continue to align and glue the formers together with the fuselage sides.

Note that the vertical formers have the grain running from left to right in the structure, while the angled formers have the grain running the longer length of the pieces of wood. With this system, you only need 1/8-inch balsa for formers. Continue this until gluing the tail post at the aft end of the fuse. Be aware of the location of the pipe tunnel if you are utilizing a piped motor.

When this basic fuselage box is done, you may remove it from the building board or fuselage construction jig. Bolt the motor in place and glue in the 4-40 blind mounting nuts. Find the nose ring and add the prop and spinner to the motor. Cut a 1/8-inch cardboard spacer to fit in front of the wood spinner ring.

Shape and adjust the fuselage sides and spinner ring so the spinner has a nice fit in front of the fuselage sides. The cardboard piece allows an almost perfect spinner fit.

When the spinner ring is glued in place, unbolt the motor/spinner and remove the cardboard piece.

Install the tail wheel plywood mount in the rear fuselage section. Add the fuselage bottom wood located just behind the pipe tunnel and glue between the sides at that spot. The tail wheel mount should be a tight fit up against the back of the last vertical former and the fuselage sides. The fuselage bottom wood also braces the mount for a stronger fit.

The main gear hardwood blocks can now be installed tightly up against the rear of Section B and glued solidly to the fuse sides. Place the aluminum landing gear in the proper location; mark the bolt holes and drill to a nice fit for 4-40 bolts. You should have enough room to attach and glue the 4-40 blind mounting nuts on the "top" side of the hardwood mounts. If you desire you can estimate the locations and installation of the blind mounting nuts prior to gluing the landing gear mounts in place.

Begin to assemble the cowl parts. Glue the cowl hold-down plywood pieces to the inside of the balsa cowl sides and they project up inside the fuselage doublers and sides. Trial fit the cowl to the fuse and tack-glue in place. Shape the outer lines of the cowl and then drill the four cowl hold-down bolt holes. The first hole should be drilled to accept the 4-40 bolt. Pop the cowl free from the fuselage. The inner side of the fuselage/doubler holes should then be opened to accept a 4-40 blind mounting nut. The blind mounting nuts can be glued in place at this time.

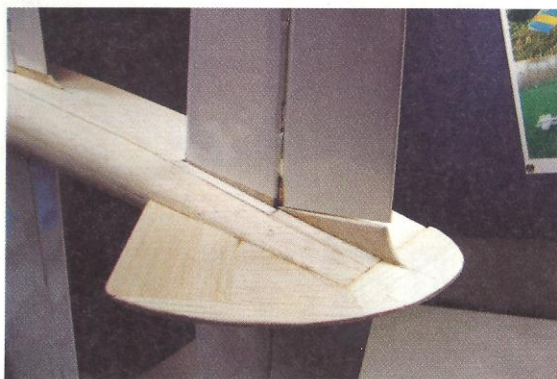
Re-bolt the motor, with spinner, back into the basic fuselage crutch. This will allow you to hollow out the inside of the cowl to fit the cowl over the motor and muffler or pipe. This is a slow process, but simply hold over the motor, take away some balsa and repeat this until the cowl will bolt down over the motor. It is best if the cowl has only 1/8-inch clearance around the motor so as to force cooling air around the hot case. Exit holes at the bottom of the cowl for muffled motors should be three times the air intake holes in the front of the cowl. This helps exit hot air during flight.

A hole in the side of the fuselage will need to be cut if you desire the muffler to exit correctly. Attach the shaped top block and tack-glue in place. When dry, carve the top block to a more final shape, pop off, and hollow as needed. No shape changes are needed if you use the top block and decide to paint a canopy. If you choose to use a plastic canopy, you must determine where you will use it and properly cut out the block to fit the plastic part.

Always "dig" a trench for the canopy installation and undercut the aft canopy area on the wooden turtle deck to allow a smooth connection to that surface. The vertical rudder can now be tack-glued in place and a more final shape can be sanded into the rear fuselage area. Once satisfied with the final lines, the rudder area and top block can be popped apart from the basic fuselage crutch.

Assembly

Install the wing from one side of the fuse-

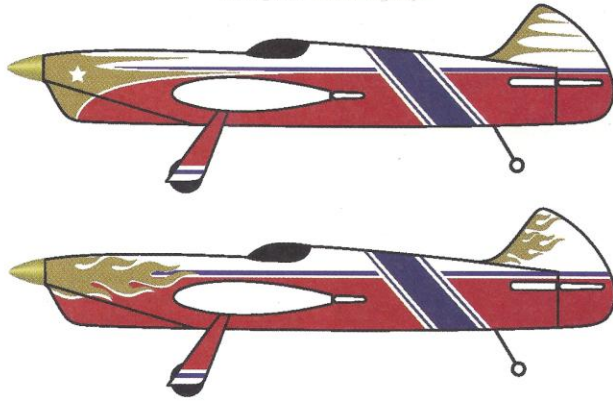


The tail section is assembled (above left) and ready for the final sanding. Note the direction of wood grain on the various sections of the rudder and fin. For



Michael's prototype of the Encore 50, a PA .61 was installed (above right) on the engine crutch. At this point the cowl blocks are merely roughed out.

Encore
next generation legacy



lage without cutting away any major parts of the fuse plywood doubler. This is simpler than it seems. It would be best to insert the wing in from the inboard side. Unhook the flap horn from the flap. Cut out two small slots where the bellcrank music wire must clear the fuselage at its insertion. These cuts are made only on the inboard side. Also cut out a triangle section at the upper aft end of the inboard wing hole. This will be used to clear the pushrod as it enters the fuse at that point. It will be re-glued in place after the wing is fitted.

Place the flap horn in its proper location so that the joiner bushings are at the fuse/wing joints and tape or pin in place. The bushings will be held securely between the back of the wing and the forward section of the wing hole. Carefully slide the wing into the fuselage and just have enough clearance to accomplish the installation.

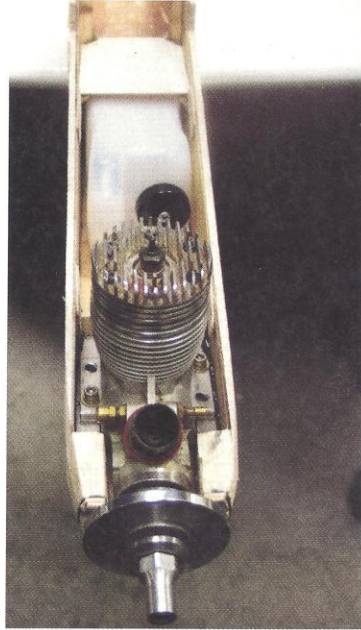
Once the wing is in place, pin it and measure all dimensions to be sure the wing is straight in the fuse. Re-install the motor in the mounts and use an incidence meter and adjust the wing and motor so they are equal in thrust lines. Be sure your flap horn joiner bushings are in their right location and then the wing can be tack-glued in place. Attach the flap pushrod to the flap horn and close the triangle hole cut in the side earlier.

Recheck the flap and bellcrank neutral at this time. Make any changes to satisfy the needs of an equal movement of flap to bellcrank and that it moves as smoothly as possible. You will have to cut out some vertical slots in the upper fuselage former areas and over the stab location to install the elevators and stabilizer. The elevator pushrod is securely attached to the elevator horn. Make up two corrugated cardboard templates. These templates must duplicate the combined airfoil of the stab and elevators as assembled. Slip the templates over each end of the total assembled tail surfaces and then attach the front of the elevator pushrod to the flap horn in a secure manner. You may have your own system, but the ball joint items I use simply bolt to the flap and elevator horns.

Lay the entire pushrod and tail assembly down and pin in place. Adjust the stab hole either fore or aft to give a neutral to the installation portion. Again use the incidence meter and check for proper alignment of the engine, wing, flaps, stab and elevators. Once happy with all measurements, glue the stab in place. Now refit the slots cut from the fuselage formers back in place and re-install the fuse sections above the stab.

If desired, add some 1/8-inch plywood pieces to the upper and lower bellcrank mu-

Sina Goudarzi drew this proposed color scheme of the *Encore* (at left) for Michael Schmitt. Sina and Allen often meet up at the Polk City and Sig contests in the middle of Iowa. Sina is so much fun and has such a great talent for designing paint schemes with his computer programs. The PA .61 is shown sans cowl blocks (below). Fit the cowl opening tightly and sand the cowl blocks to fit the outer shape. Then bolt in the engine and begin carving out the interior of the block to slowly fit the cowl over the engine.



sic wire pivot structure. Dry fit these and determine where the bellcrank wire hole should be and drill where needed. These 1/8 x 1/2 plywood pieces are the width of the inner fuselage dimensions at the bellcrank location. They are epoxied so that they run from both inner fuselage doublers and solidly glued to the wing on the top side and at the lower side.

The wing and fuse joints can be strengthened with some 3/4-inch wide fiberglass and an appropriate amount of slow curing epoxy. Apply these all around the joining surfaces



The gold leaf is being applied (above left) to the nose section. Gold leaf can be found at Michaels craft stores in Allen's local area. The gold leaf must be



applied with glue (above right) also purchased from the same craft store. Disaster will occur if the specific instructions aren't followed. Practice first!

Encore 50



The *Encore* on the grass at Ned Brown Woods in Schaumburg, IL and ready for the first flights. Michael CDs a very efficiently run contest there on the Memorial Day weekend. Though Mike covered the entire plane with white Ultracote, he decided to paint the color trim on top of the Ultracote.

and allow to cure. Add in any small formers inside the fuse before closing up the top with the pre-shaped top block. Re-glue the rudder back in place and final sand all surfaces.

Finishing thoughts

The choice of finish is up to the discretion of the builder. There are such a variety of ways to complete the "pretty" part of the building process and so many experts have their own way. I would suggest going to the owner of a wonderful looking model and ask him to discuss with you his or her finishing techniques. If that modeler is willing to help you—which I think he or she would—please follow their advice. Finding less success by changing the "formula" should not be blamed on the "teacher". Give each finishing rule the full value of its rationale.

I suggest practicing a basic but effective finish using Ultracote thermal shrink covering as advertised and sold by Hangar 9. Check your local hobby stores for the product, or use an Internet search engine for access to Hangar 9's website. Many of my friends have extolled the virtues of Ultracote, and I suggest testing the waters yourself.

Roy Trantham recommends that you have three irons readily available. Both of the larger irons should be covered with a soft cover to prevent scratching. One is set to the

temperature suggested to "stick" down the film and the other is set at the "shrink" setting. The third iron is the smaller size to facilitate sticking the film to the fillet areas. Working with the instructions, you will find Ultracote to be easy to use and effective in attaching a workable finish to any model.

Be sure that all wood parts have the fits and clearances that you desire before beginning to cover the flying surfaces. I always cover a bottom surface of each lifting section (wing, flaps, stab and elevator) first when ironing on any film type finishes. The upper surface should always lap over the bottom covering to facilitate an overall good aesthetic look while offering an effective fuel proofing of both pieces of material.

Always leave a bare wood section where you will be gluing one part to another. All glued areas must be wood-to-wood tight fits.

I also covered the fuselage with Ultracote. I began with the outboard rear section fuselage back half, then added the nose outboard front part to overlap the first film added. I then worked on the inboard rear half and finished with the fourth piece, which is the inboard nose portion. All the film should lap over toward the outboard side and overlap the rear sections with the nose sections. Even though I was going to clear coat the entire model with an automotive paint, I still



Allen Brickhaus is at the controls. He is very pleased with the prototype as built and flown by Michael. Its success has motivated Allen to build his own version of the design.

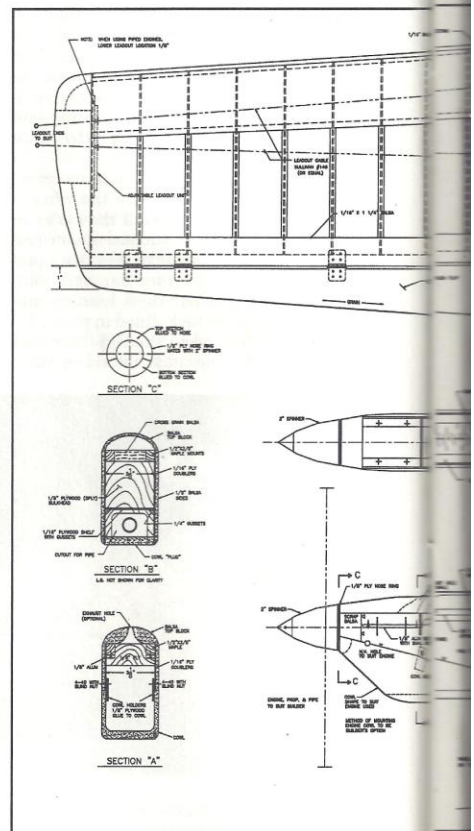
kept the direction of flight and the overlap of films in mind while covering the fuselage. Continue all this until all essential parts are covered to your satisfaction.

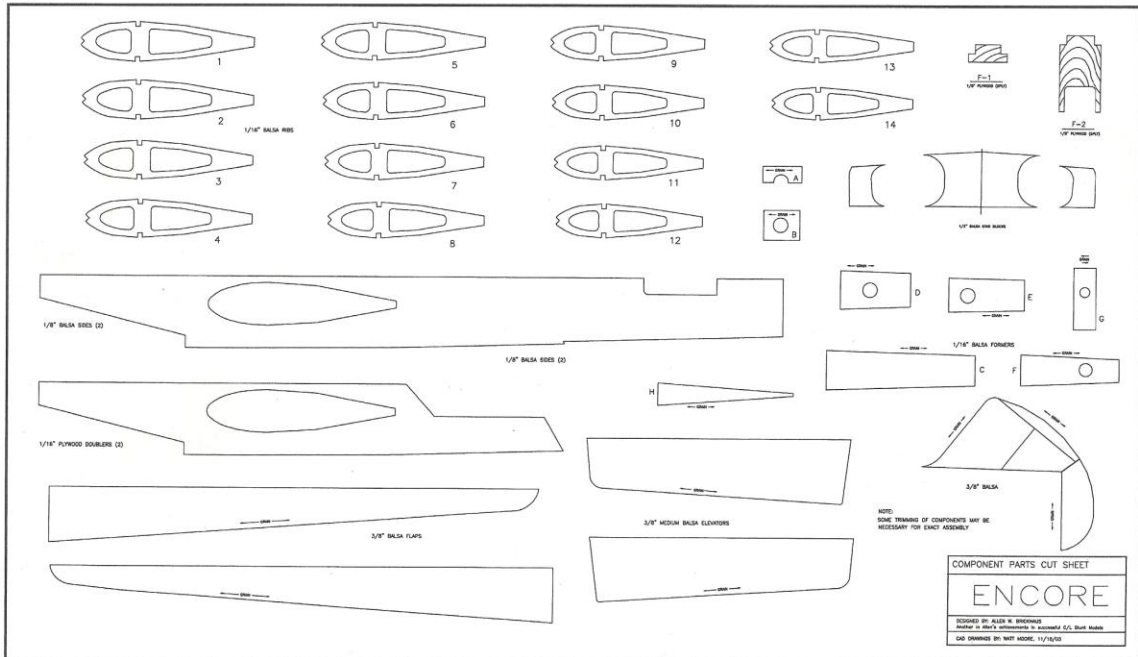
Flying information

Gleaned from multiple flights with my *OPUS*, *Legacy*, *Savoy* and *Arcturus III*, the PA .61 is flown with lines measured eyelet to eyelet of 63.5 feet, with a venturi diameter cut with a #11 drill bit, a Bru-Line green (fine) filter, 10% nitro 20% oil (half castor and half synthetic) coming off the ground at 9900 to 10,000 release rpm with a Bolly 12-3.9 tri-blade carbon fiber prop. This combination yields a lap time of 5.40 seconds. A load of 6½ ounces of fuel will give you about a seven-minute full flight time.

This *Encore* would be very acceptable to a wide variety of engines in the .50 to .61-displacement range. At 665 square inches and a suggested finished weight of 60 ounces, the *Encore* should offer you a very tractable model to fulfill your needs in sport flying or competition up to the Expert and Open Stunt levels. The previous series were Nats proven and the *Encore* should be no different.

Enjoy the fruits of your labor, listen to advice, follow that successful advice and join a club with one or more successful pilots. The advice of higher-level pilots should help you avoid the costly mistakes they made in their learning curve. They have also "goofed" and will pass those learning lessons on to you with little or no cost. Your cost is probably





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