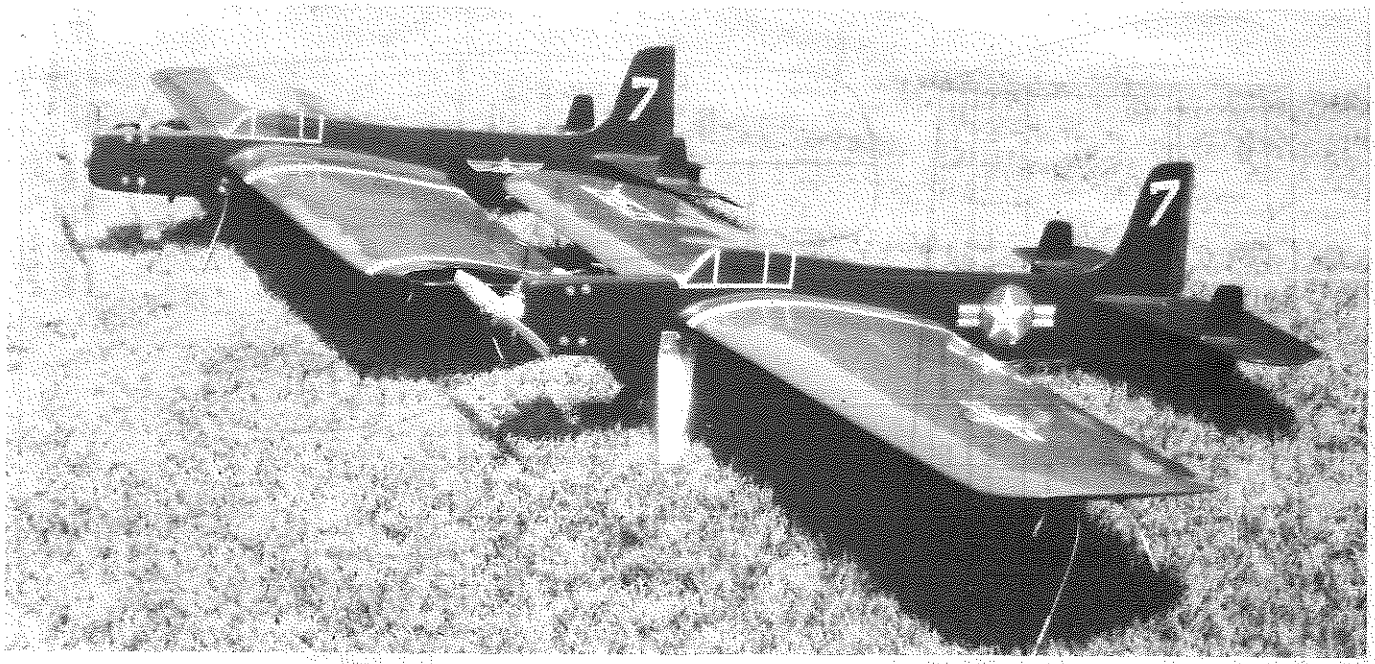

THE PROFILE GUARDIAN

By BILL MELTON . . . The Guardian has been a long-lasting favorite in Navy Carrier, and if contest results are any indication, the profile version could continue to dominate in that class.

• When the profile carrier event first started, everyone was quite happy with the relaxation of rules on the design of the planes. A common statement was, "Now we can see something other than Guardians". I was also kind of tired of Guardians, and started a series of planes based on the Airobonita. Three or four of these were built and none of them were really successful.

About this time, I realized that there were no profile Guardians flying in the area, and so in order to do something "really different", I designed my first profile Guardian. The original was really loaded with all sorts of moveable surfaces, automatic adjusting-line sweep and all other features I could think of. The plane was an immediate success and lowered our low speed times by 3 to 4 miles-per-hour. However, over a period of time, the flaps were glued up, rudder movement was limited, the inboard aileron was fixed, and the automatic line sweep mechanism converted to simply an adjustable line sweep as usually encountered on stunt planes. A few other changes were made in moments and airfoils but the basic design was unchanged.

Since that time, there have been 25 to 30 copies of this plane built in the area. It has been a winner in almost all area contests. High speed is generally in the 75 to 80 miles-per-hour bracket (or as fast as your engine will run), with low speeds around 18 miles per hour. Our record official low speed was 14 miles-per-hour by Fred Malone, of Albuquerque. Fred also missed the deck on this flight. This is really not too bad when you figure we are flying at elevations of 4000 feet and up. The final compliment for the design occurred at our July, 1975 contest, when all profile carrier entries were this profile Guardian. I think I should start hunting a new design.

Construction is really simple, and I am sure the entire plane could be built in less than a week, if required. The flat-bottom airfoil really simplifies this part of the construction. The first requirement is for a warp-free building board.

The building sequence of the wing is as follows. The leading edge planking is pinned to the board. The spar is glued along the edge. The leading edge is glued on the leading edge of the planking with a 1/2 inch sweepback. While this assembly is drying, the ribs can be cut out. The tip and root ribs are traced onto 3/32 plywood and cut out to serve as templates. Balsa rib blanks are sandwiched between these templates, bolted together . . . and with a little carving and sanding you have a set of ribs.

The trailing edge planking is then pinned down parallel to the leading edge, and with the proper spacing between leading and trailing edges. The ribs are notched for the spar and glued in place. The trailing edge is trimmed off, allowing about an 1/8 inch margin behind the ribs. The spar between the center ribs is removed and the 3/32 plywood bellcrank mount epoxied in place. The top spar can now be added. Care should be taken at this point to make sure the wing is still flat on the building board. The spar for the aileron should be installed at this point, as well as the control horn for the aileron. Make sure the bearings for the control horn are well epoxied to the supporting ribs. The trailing edge planking can now be cut to shape and glued in place.

The wing is removed from the building board, the excess leading edge planking trimmed off, and the leading edge carved to conform to the curvature of the airfoil. I generally install the J-Roberts bellcrank, complete with lead-outs and stub pushrods, at this point. Care should be taken to get the bends in the throttle pushrod correct and to make sure it does not bind in the slot cut in the bellcrank platform. It is then a simple matter to plank the leading edge, the center section, and add the capstrips.

The aileron is carved to shape from solid 1/2 inch balsa and installed with nylon hinges of the pinned type. Epoxy-lite putty is used to put in all hinges and control horns. Care should be taken to insure that the pivot point of

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the hinges is in line with the pivot point of the control horns.

The tips are cut to outline and glued on. These should be made from very soft balsa. If the adjustable leadouts are desired, the inboard tip rib mechanisms should have been installed during the wing construction. The inboard tip must be hollowed to clear this mechanism. The leadout position shown is about right for 90 percent of the flying, but it is nice to have the option of adjusting the leadouts for different planes and for different flying conditions. If the details of the adjustable leadout mechanism is not clear, I would suggest that you refer to some of the recent articles on stunt designs, as about 99 percent of the recent models employ adjustable leadouts. Brass tubing was used for leadout guides on the originals. About 1 ounce of tip weight was also used. Sand wing to final shape with 320 and 400 sandpaper.

The fuselage is cut from 1/2 inch C-Grain balsa. The motor mounts and plywood doublers are epoxied in place. The hook mounting is simply a short piece of 3/8 x 1/2 motor mount stock epoxied into the location shown on the plans. The fuselage should now be carved to shape (roughly an egg shape), the plywood edges rounded, and the tail end narrowed from a point behind the elevator control horn to about 1/8 inch thickness. Do not thin out the area in which the stabilizer is to be mounted.

The rudder, stab and elevators are now cut out and shaped to an airfoil section. I like to install the control horn in the elevators before putting in the hinges. This seems to help me get things lined up easier. It should also be noted that the control horn is not centered between the elevators, but is offset to the outboard side. After installing the hinges, the entire horizontal tail surface can be sanded to remove any small errors due to alignment.

The torsion rod for the kickover rudder is formed from 1/64 music wire. Remember that the angles of the bends you put in this rod determine the amount of movement you will have. We generally use about 20 degrees of rudder movement. The sub-rudders (or whatever they are called on the Guardian) are cut from 3/32 balsa. I like to attach them to the stab before assembly to the fuselage.

Assembly is simply gluing the pieces together. I use epoxy for all wing-to-fuselage joints and for the stab and rudder-to-fuselage joints. Care should be taken to insure accurate alignment of parts. Note . . . there is a little negative incidence in the wing. This should help a little on the top end without decreasing low speed performance.

The tailskid is installed by cutting grooves in the fuselage as shown on the plans, bending the wire accordingly, and then epoxying the wire into the fuselage. The slot in the wing for the pushrod going to the elevators should be large enough to prevent binding and then faired over with a balsa cover. The gadget that holds the rudder in neutral for the high speed portion of the flight is simply a piece of 3/32 O.D. brass tubing onto which a spring has been soldered, and a piece of 1/32 music wire (to catch the hook) is then bent and soldered to the spring. Sufficient wire is left sticking out of the top to insure catching the rudder. Allow at least a 1/4 inch of the wire to show when the spring is depressed by the raising of the hook. To install this gadget in the fuselage, first drill a hole from the bottom to the top at the location shown on the plans. Then, with a Dremel tool, enlarge the bottom portion of this hole to clear the spring. The assembly can then be installed into the fuselage with epoxy. The top of the brass tubing should be flush with the surface of the fairing between the elevators. Make sure the portion of the wire bent to catch the hook is long enough.

All fillets are made from Sig Epoxylite putty. This material should be mixed according to directions, smeared on the area involved, and shaped with a moistened finger. Almost perfect fillets can be made in this manner, and only a small amount of wet-sanding will be required for finishing. Care should be taken to fair in all joints. Those sharp changes in shape can cause a lot of drag.

For finishing, I paint the fuselage and tail surfaces, and Monokote the wing. First, mask off at least a 1/2 inch of the planking in the center section of the wing to provide a place to stick the Monokote. Apply two coats of Sig Lite-Coat dope to the surface of the fuselage and tail surfaces. Sand smooth. I then apply three coats of Sig sanding sealer and sand very carefully to remove most of this material, as it is quite heavy. Finish sand with 400 sandpaper. Fill scratches and dinks with "stuff" or spackling putty. Set the plane aside for about a week for curing and then spray two coats of Super Poxy on the fuselage and tail surfaces. To prepare for the Monokote, finish sand with 400 sandpaper, carefully blow off all sanding dust, and then go over the wing surface with a tack rag to remove any foreign material. About the only hints I can give on applying Monokote is to make sure you do not iron in any wrinkles around the edges when ironing it down. Shrink with a heat gun.

I usually start the final assembly by putting on the landing gear. The gear is made in two pieces and joined together in the center with a piece of brass tubing. The gear is held in place with K & B landing gear clamps. I have also used aluminum landing gears.

The engine is then mounted and the stub pushrod joined to the throttle with a Quick Link. The stub pushrod from the bellcrank is joined to the elevators using a coupler from Quick Link. The hook is bent to fit and a horn soldered onto the hook to work the aileron. A spacer is generally necessary on the outboard side of the fuselage to provide working space for the horn. The horn is connected to the aileron control horn by use of aileron connectors commonly used in RC and a pushrod with two Quick Links. One end must be fixed to prevent the pushrod from making its own adjustments. A short pushrod is then soldered to the elevator pushrod (underneath the stab) and run through a short piece of brass tubing for a bearing. This bearing is epoxied to the fuselage side. A loop is then soldered to the hook of a length appropriate to hold up the hook and to provide enough upward movement of the spring on the rudder holder to engage the rudder and maintain it in a neutral position. The wire which holds up the hook is then trimmed so that a certain amount of down elevator will release the hook. Additionally, two small hooks are fixed to the hook and to the fuselage to hold a rubber band. The rubber band provides tension to hold the hook in the down position and to activate the aileron.

The profile Guardian fleet. They all look the same, but no two are alike.

The Guardian will certainly furnish you with a good start toward enjoying this enjoyable event. I have had more fun flying these planes than probably any that I own, yet I have won less. The closeness of the event makes it one of the best we have. I hope you enjoy your Guardian as much as I have. ●

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