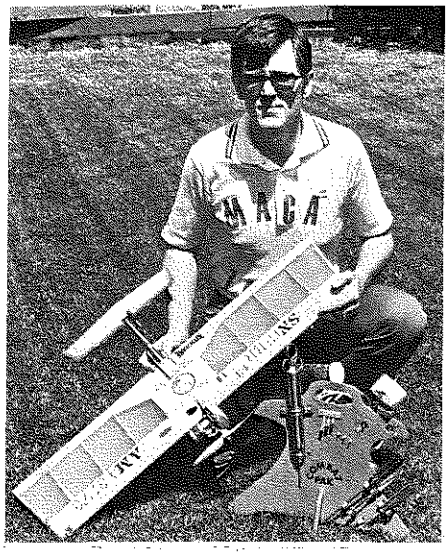
THE SNIPER MK/VII

By WILLIAM "MOOSE" ALLEN . . . Something a little different in combat models . . . the tail moment is adjustable to your reflexes, and many parts may be cannibalized after breaking the ground barrier.



"SNIPER." It features:

Extendable tubing boom which allows for adjusting the plane's flying sensitivity to each individual flier's reflexes.

Allows for any engine/prop/tank set-up to be "tuned-in" to the airframe's finished weight and mass distribution.

Boom/Stabilator are replaceable. This integral feature allows for a savings of time and expense.

Trimming the plane's flying ability takes only two minor adjustments.

Design eliminates the need for wingtips and saves time in construction and covering.

"ROCK-STABLE" flight characteristics.

The basic makeup of the SNIPER is simple, straightforward and easily cannibalized. This is an added plus when the need arises, during the contest, or the night before, when your pride and joy plugs itself into old mother earth unannounced!

BUILDING JIG

Frankly, this is a must for the serious builder/competitor. The one I use is simply constructed and will accomodate many other combat wing design on the contest circuit today.

Begin with a 48 x 11 inch piece of staircase stepping. Staircase stepping is available at any lumber yard. The use of this material is important because the grain is vertical, which guards against warps and twists. In its selection, I suggest that you check it for those warps and twists with a metal straight edge, lengthwise and from corner to corner.

Two pairs of 2 x 2 metal right-angles (strapping type) are positioned along the radiused edge of the stepping, spaced 37 inches apart (18½ inches from each side of a center-line located on the board surface). At each end, the right angles are spaced apart just enough so as to act as a channel for the pivot screws attached to a 36 inch metal ruler. I suggest that 8–32 (1¼ inch) spade bolts be soldered at each of the ruler ends . . . although an 8–32 nut could be soldered to the ruler end through which the bolt will pass. Mounted in the channel, the ruler will act as a trailing edge support which will pivot to the angle that each airfoil dictates. Balsa jig blocks, cut to the correct angle, will act as supports for the ruler. I recommend that a coat of gloss resin, varnish or some form of clear protective finish be painted on the building board surfaces. This will prevent moisture from entering wood pores and also provides a surface for marking rib positions, which can be erased as needed.

The basic 36 inch airframe rectangle should be lined on to the board surface. This is easily done by finding the center of the board and placing a mark. From this center line, two end lines are marked . . . 18 inches each side of the center. These lines are marked with a square. Mark one of the end lines "inboard" and the other "outboard", referring to the basic makeup of the airframe. Since you are going to work on airframes from in front and in back of the building board, mistakes can happen without having these reminders constantly in view.

For the deluxe treatment of this building surface, a layer of cork could be applied for a better pinning surface. If you spend the time to build this right, it will work for you for many years.

I'm going to preface the construction of the airframe with specifics regarding some of the basic assemblies of the Sniper's integral parts.

MOTOR MOUNT

I use Titebond white glue throughout. The 1/8 inch dowel pins are an absolute MUST! The reason being to prevent splitting from vibration. The glass cloth/resin finish is added for durability and looks. Alignment of the maple engine bearers is very important. After the bearers are cemented to the spacer, a center line should be drawn horizontally which will ultimately be matched to a center line drawn on the two center ribs for true incidence. THIS IS ALSO AN ABSOLUTE MUST!!!!

Make a template of the mount outline and use this for a cutting template after the gluing is complete. An option to the mount design shown is the "BOSTA" or "NEMESIS" styled short mount. I decided on the mount shown so that if additional weight should ever be needed up front, the nacelle could accommodate it. It additionally serves as extra strength when the model breaks the ground barrier during the throes of combat.

PEN BLADDER FUEL CELL

I got tired of getting less than desired results from the usual BT-50/Toiletpaper tube construction. Ultimately I got to the use of a golf club polyethylene tube, which is light and fuelproof. I suggest the use of 5-minute epoxy in the application of the end plugs. Use the epoxy to coat the entire plug as it faces inward in the cell. Use white glue or model cement when gluing the completed fuel cell assembly into place. What you have here, then, is a total cell make-up which can be separated from the airframe when cannibalization is necessary. For reuse, scrape the ends to a somewhat smooth surface, and it's ready again. When the holes for the bladder and the drains are cut, I suggest their edges get a coat of 5-minute epoxy for total fuel proofing. The bladder compartment is ready to go and will easily accommodate the No. 24EL pen bladders I use and have available for sale.

THE CONTROLS

What always amazes me is why some people have tight-binding controls. There is simply no excuse for this! Use the following modifications for the Veco style large bellcrank: Substitute the mounting screw for an 8-32x3/4 inch screw. Drill out the bushing with a No. 22 drill; you will have to force the drill bit against the bushing walls to relieve it just a bit more. The reason for the substitution is that the screw supplied with the bellcrank is too small, and there is too much slop, thus creating a dead spot in sensitivity. For the lead-outs, I use braided flexible material. This is soldered with silver solder and wrapped with No. 28 soft copper wire. After the screw is placed, thread on a nut and tighten up against the ply floor. This is the surface on which the bellcrank bushing will ride. Add the bellcrank, and top

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off with another nut. After tightening this down against the bushing, thread on a piece of silicone fuel tubing about a 1/4 inch long. It will hold this top nut in place . . . and is vibration free.

THREADED BOOM CONSTRUCTION

There are two methods of construction of the adjustable tail section. The following will outline what is shown on the total plan format. Both give the same end-product, yet one takes less time in basic construction. The first time of construction will require a little getting use to, to get the hang of it. It's simple, yet different. This feature will allow the flier/builder to "dial" his own sensitivity into the plane's flying performance.

Much hot air has a way of finding a group of combat fliers . . . especially when turning radius and air speed is the topic of discussion. Usually none of the glowing words of wisdom outline the flier's ability to handle his fire-breathing, streamer-eater. Lack of practice normally will indicate the inconsistant performance which will result.

At any rate, we start with a clothes pin . . . available in any major food store. Trim as per the plans for the mount dimensions that you decide on . . . 3/8 or 1/2 inch in width. Cut a 1/4-20 screw or threaded rod to length. Drill a 1/4 inch hole in the top of the clothespin . . . straight. This may take a couple or three until you get it right. The aid of a drilling jig or drill press will eliminate all the hassle. I use a hand drill, so it can be done.

Epoxy (5 minute) the threaded shaft into place. Take a 1/4-20 "T-Nut" (available at any hardware/lumber store) and grind the outer circumference to meet the inside diameter of the 5/8 inch brass tubing boom.

To do the grinding I thread the T-Nut on a 1/4-20 screw and tighten another nut up against it. This assembly is chucked into an electric drill, and with the use of a medium to coarse grinding stone, the T-Nut is ground down to fit. The T-Nut is silver-soldered into the tubing. Start by wrapping a small coil of siler solder around the neck of the T-Nut. It is then inserted into the tubing to the desired location with the aid of a threaded shaft. The length of this threaded shaft will be such that it can be chucked into a vise and allow the T-Nut silver solder wrap to locate itself in the position as shown on the plans. To insure that placement, the T-Nut should be the desired distance up on the shaft (1½ inches) so that when the tubing is slipped over the assembly, the top of the vise jaws act as a stop, locating the T-Nut automatically.

BE SURE THAT THE LENGTH OF THREADED SHAFT CHUCKED INTO THE VISE EXTENDS BELOW THE VISE JAWS.

You then use a torch and heat the shaft to a cherry red; the heat will travel up and heat the T-Nut to a temperature that will melt the solder. Be sure to use the proper flux. Find the center line of the tubing to locate the tubing hingeline and secondary boom tie-down point at the trailing edge of the airframe. Drilling for the 1/8 inch tubing hingeline at the stab, I use a 9/64 inch bit. This will give a somewhat sloppy fit, which will allow the tubing to be held in proper parallel alignment while the soldering is done. Remember, after this is complete, this portion of the SNIPER can be used over and over!

TELESCOPING BOOM

Begin by cutting two 4 inch pieces of brass tubing; one 5/8 inch dia., one 19/32 inch diameter. These are available from the K&S tubing display at your hobby shop. Locate and drill the hole for the tie-down bolt in the 5/8 inch tubing. At the other end, saw a 1 inch cut along the center line. Next, find the centerline of the 19/32 inch tubing. Locate and drill for the 1/8 inch tubing with a 9/64 bit. Solder the desired length of tubing (for hingeline) with silver solder. Assembly is simple, as one fits into the other. The 1/2 inch hose clamp is then tightened down to hold the two-piece assembly in place. Length adjustments are simple. More on that later.

THE STABILATOR

Use either 3/16 or 1/4 stock (quarter-grained if possible). To shape, I use a Stanley "Surform" wood file. This is available in any hardware store. It will help take care of the bulk of the shaping. The rest is up to the No. 220 sandpaper and you.

Draw a centerline along the LE. The 1/8 tubing is located along that line and glued into place with white glue. Since I finish with resin surfacer and epoxy paint, I wrap fiberglass over the tubing and extend it on to the wood surface. You might also want to reinforce in the area that the control horn is located. Use 1/32 ply on top and bottom of the stab to "sandwich" the balsa. Since this area will be covered by the glass cloth, I suggest it be done at the time the tubing is aligned and glued. By the way, to perfectly align the tubing along the hingeline, I suggest you slide in a length of 3/32 music wire until the glue is dry. Be careful not to let glue seep along the hinge pin. Again you have a removeable, reuseable part!

WING AIRFRAME CONSTRUCTION

The all-time enemy of the combat ship is the warp! It definitly affects flying characteristics and performance. Initially, most of the problem can be corrected while the airframe is in construction. The jig eliminates the major twists, while saving a great deal of time.

To start, mark the rib positions with a square. Tack-glue 1/4 x 1/4 balsa on each side of the rib lines so that the rib itself can be easily placed without leaning. These positioning "bosses" are located on the board surface just forward of the spar.

Be sure the alignment of the rib bosses is straight and true along the length of the span. For ease of marking rib positions, the TE balsa is butted against the rib bosses and a pen mark is then made. The marked TE, is positioned on the ruler support and held in place by means of spring-loaded clothespins. To insure that all ribs are properly aligned on the TE, mark a line parallel to, and 1/8 inch forward of, the aft edge of the TE.

Important: Be sure that you don't forget to mark a center line on the inside of the two center ribs . . . as this will be your only aid (outside of your eyeball) to aligning the horizontal angle of the motor mount.

The ribs are now glued into place. Next glue on the top TE piece and the top 1/4 inch spar. DO NOT glue the two center ribs to the spar at this time.

The airframe is removed from the jig and the other spar is glued in. While the glue is still fresh, the motor mount is glued and positioned between the two center ribs . . . matching the center lines drawn earlier. Here is where centerlining makes the job easy.

I use a "C" clamp to hold the mount while it is "sandwiched" into place. Gently balance the airframe on its TE and lean it up against something. While in the vertical position, the LE spruce spar is glued in place and held with rubber bands. Clamp the plane in a vise at the two center ribs which "sandwich" the motor mount.

Now that your hands are free, you can twist the wing structure to counteract any twists that have found their way into it. Do it while the glue is still wet and pliable. The rubber bands will allow for the necessary twisting action. After you feel things are as straight as they're going to get, leave the structure until dry. Should you feel more twists have yet to be eliminated, you can attack that problem while installing the LE planking.

Next to be added is the bellcrank system, as outlined earlier. I suggest the plywood flooring be pre-drilled prior to gluing in place. Install the balsa gussets which are the major supports at the TE. After the glue has dried, the TE is cut completely away between the two center motormount ribs. The plywood brace is glued into place as it is keyed into the motormount section. Use the centerlines on the inside of the motor mount ribs as your guide. It will be glued right over the line. Now use white glue to install the clothespin. You'll note there is some "play" in the

fit of the clothespin. Shim with balsa.

Now for the LE planking. This is another point in the building schedule that will allow you to eliminate any warps or twists that have created themselves. To check for these (which you should do anyway . . . don't assume they don't exist) I suggest that you find two very straight quarter square spars, and place them on the airframe, spanning the cord from LE to TE, one on each wing rib near the tip. Back off from the structure about ten feet or so and check the two spars for alignment. If there is a twist you'll have no trouble seeing it! In the application of the LE planking, the twists can be corrected by counter-twisting the structure immediately after the planking is glued and pinned in place.

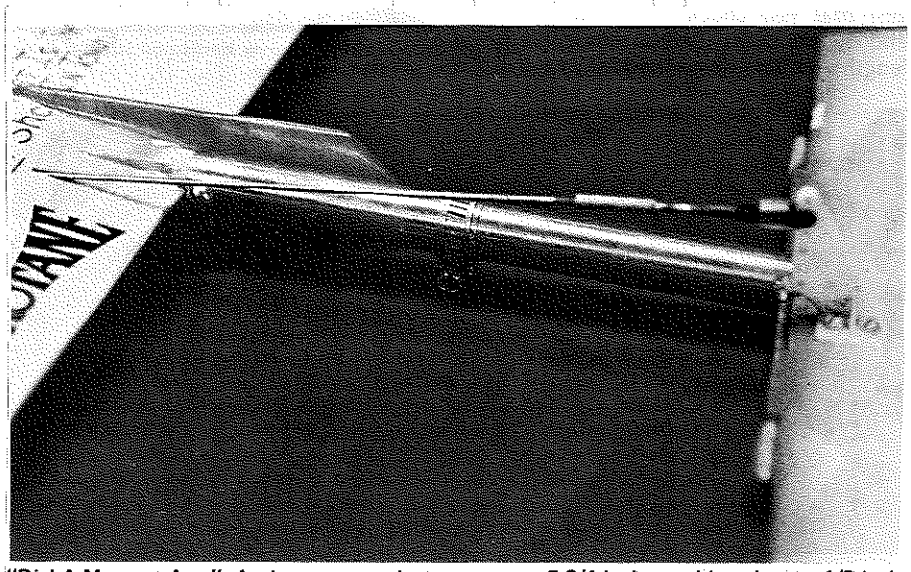
After the LE planking is complete, the center section can be planked and the cap strips put on.

Next, the nacelle is added. I suggest that just before it is glued into place, the blind-mounting nuts be packed with vaseline so that glue or resin doesn't seep into the threads. Shape with a model knife and No. 220 sandpaper. Add cloth and a coat of surface resin (Hobby-poxy or K&B).

Sand the entire structure with No. 220 and prepare the covering material of your choice per the cutting instructions on the plans. Covering is the last step in trying to stop any warpage or twists that still remain.

After covering is complete, the secondary boom is positioned and the mylar is marked so that it can be removed for the gluing of the boom. Again, 5-minute epoxy is used. Add the boom assembly and set it up for 6 inches of moment arm from the TE. This will give you good positioning whether you have a Tigre or Fox. Presently, with my Fox 36X, I use a moment of 6¼ inches. But that's me . . . my reflexes aren't what yours are. You'll have to experiment. That's the name of the game . . . consistency . . . and that comes from PRACTICE!

There you have it . . . your first SNIPER. Enjoy it . . . like potato chips, one leads to another. I'm interested in your experience with this design. As you can see, there has already been an addition to the plans and this will continue as ideas come in. On the boards at this time are the plans to produce this in kit form and also an FAI version. Your name will be carried on a list of the "SNIPER SOCIETY", and you will be updated as things develop. In the meantime if you haven't done so already, join MACA . . . a great organization for the advancement, betterment and promotion of control line combat. Keep in touch.



"Dial-A-Moment-Arm". Author suggests that you start at 5-3/4 inches and lengthen an 1/8 inch at a time until the length matches your reflexes. How about 10 inches for "the morning after?"