MARA champion after a year of tough competition. Powered by K&B .15 and Rev-Up 7-6 Series 400 prop. Top Flite 7-6 narrow works equally well. All-up weight 2-1/2 pounds on the nose (minus 2-1/2 oz. of fuel).

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Bill Fuori's

Quarter Midget

THE MODEL you see in the accompanying photos is the result of an evolutionary process of about two years. It all began with my purchase of a House of Balsa "Shoestring" kit. This was one of the finest kits I had ever seen.

It was quite evident that a great deal of thought had gone into the engine compartment design and method of constructing the wing. I found the instructions easy to follow and the resulting model faster than its competition. Soon, however, others realized the merits of the Shoestring with a new one appearing at virtually every race. It was then I realized that some modifications were necessary if I was to maintain an edge over the competition.

Recessing the hold-down screws into the hatch reduces drag and increases overall appearance. Use of liberal fillets to blend in cheek cowls and between the wing and fuselage are essential.

I began by experimenting with the airfoil. As the kit wing was approximately ⅛" thicker at the root than the minimum allowable specs, I began by streamlining the wing. As a result of several experiments I came up with two improvements over the kit airfoil. One proved best on the shortened course (currently used in California and a suggested modification of the rules) while the other was best on the current course. The short-course airfoil is shown at the top righthand corner of the construction plan while the long-course airfoil is shown on the profile view of the fuselage.

I also experimented with a foam wing which performed equally well with the built-up wing if care was taken to keep it light. More about construction details later.

The next change that seemed apparent was to slim and streamline the fuselage. Since I coupled the aileron with the rudder (see half rudder on the plans) I no longer required a fuselage width capable of supporting three servos across. Slimming the fuselage frontal area resulted in the

engine head protruding through the cheek cowl, but I prefer this to a completely cowled engine.

The result of the above changes, together with some construction variations discussed later, resulted in a truly competitive racer. This can be supported by the fact that it has brought home the hardware in each of the many races held by MARA (Metropolitan Air Racing Assoc.). However, it has more assets than simply raw speed. Its greatest asset is in its ease of handling and stability. I have never found it to drop the slightest in the tightest of turns with no opposite rudder required to accomplish this.

The model may be constructed from scratch using a built-up or foam wing, or it may be constructed by modifying a House of Balsa Shoestring Kit. I would suggest the latter if time is a critical factor. In the remainder of the article I will describe the steps in scratch-building the model.

The first step is to determine whether a built up or foam type wing will be used. Construction times will be similar with the resulting built-up wing being a couple of ounces lighter and equally strong. Once the type of wing has been determined, fuselage construction can commence.

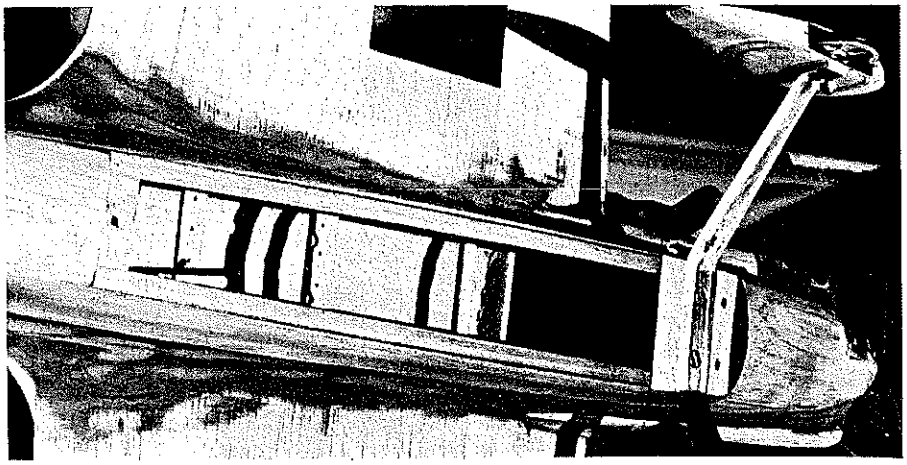
Construction

Fuselage—Part 1: Begin the fuselage construction by cutting out the ⅛ in. fuselage sides, the 1/32 in. plywood doubler, and the three plywood formers. It is important to select matched sheets for the sides, and to cut out the holes in the doubler to allow the sides to contour properly as well as to keep down the overall weight. If the wing is to be the foam type, the diameter of the front two lightening holes is reduced to 1 in., and the shaded area shown on the plan must be marked on the fuselage sides for later removal.

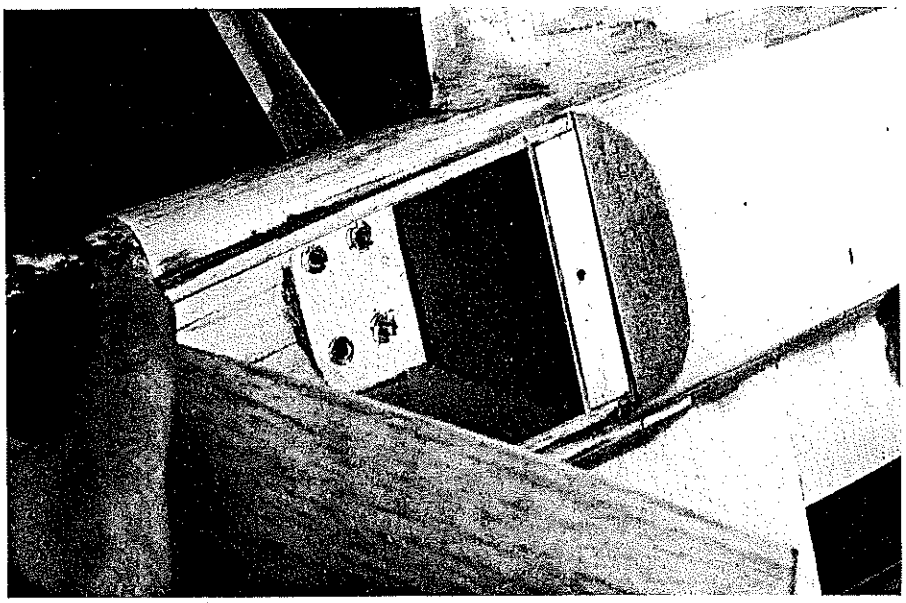
The plywood doublers are then epoxied to the sides being certain to make a left and a right side. When this has thoroughly dried mark the position of formers 2 and 3, and if a built-up wing is to be used, mark and drill out the holes for the fiberglass arrowshafts. Glue 5/16 in. triangular strips at the top and bottom of each side, leaving a cutout for former 3. Install ¾ in. triangular stock at the bottom of each side between formers 1 and 2, ¼ × ½" balsa hatch supports between formers 2 and 3, and a 1/16 × ⅜" cross brace. Formers 2 and 3 are then epoxied to the sides. Be sure the formers are square with the fuselage sides. After this has set, former 1 and the triangular filler at the rear are epoxied in and the assembly set aside to dry thoroughly.

Next epoxy a 2 × 4" balsa block to the front of former 1 at a right-angle to this former. The right face of this block must line up with the center line of former 1. Cut out and epoxy the 1½ in. diameter ply disk to the front of this block so that it is centered with respect to the engine thrust-line.

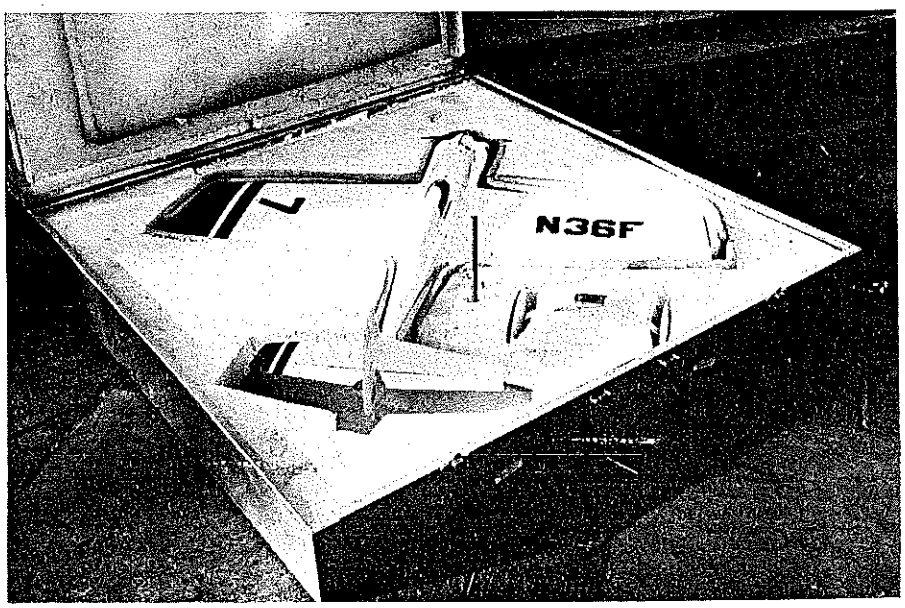
continued on page 10



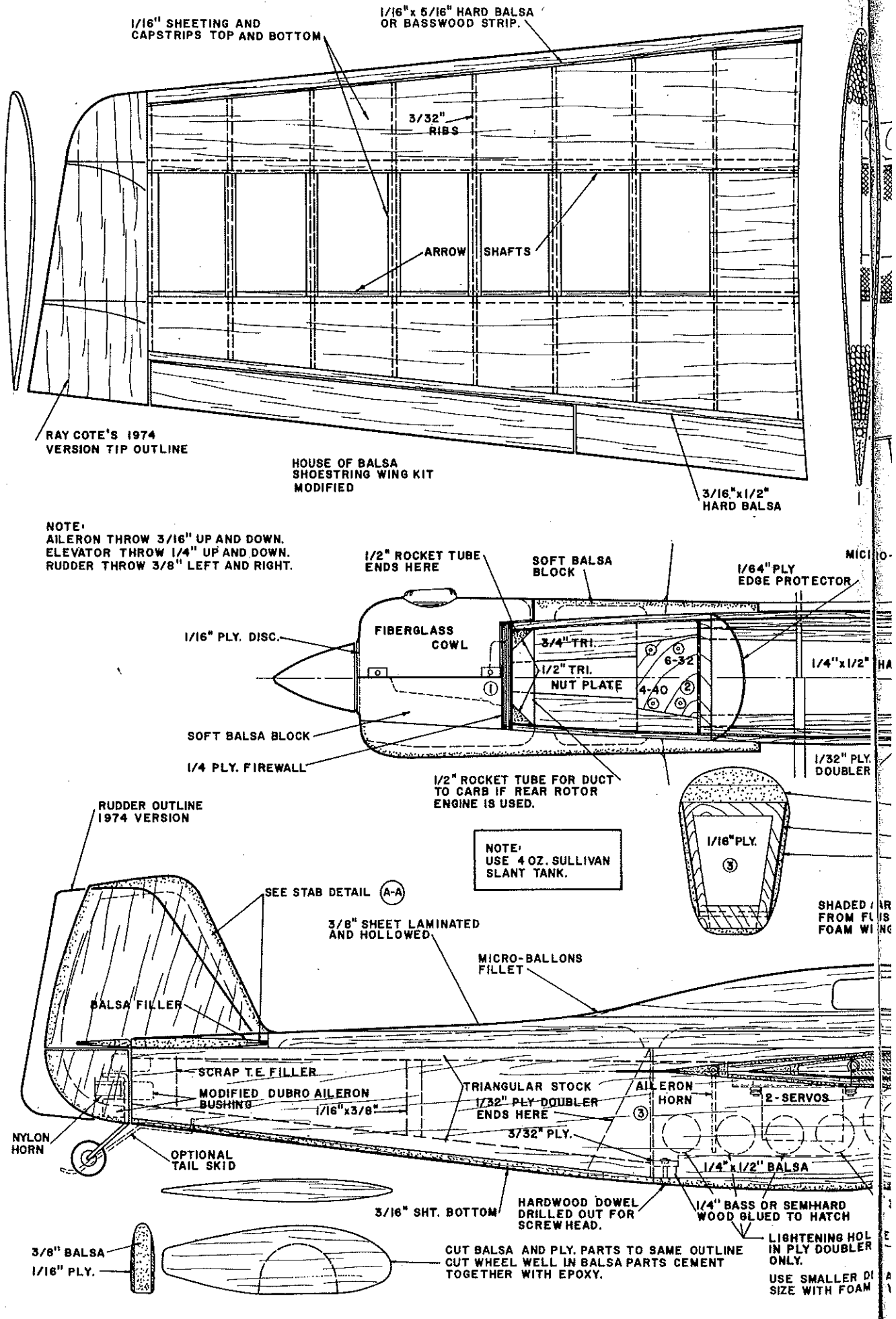
More than adequate room for receiver, battery, switch and two servos (elevator and coupled rudder/aileron). Throttle servo is mounted in tank compartment for easy access. Note airfoil shape filed into aluminum gear struts. After painting, the nuts holding wheel pants in place are moved inside pants and bolt ends cut off to reduce drag.

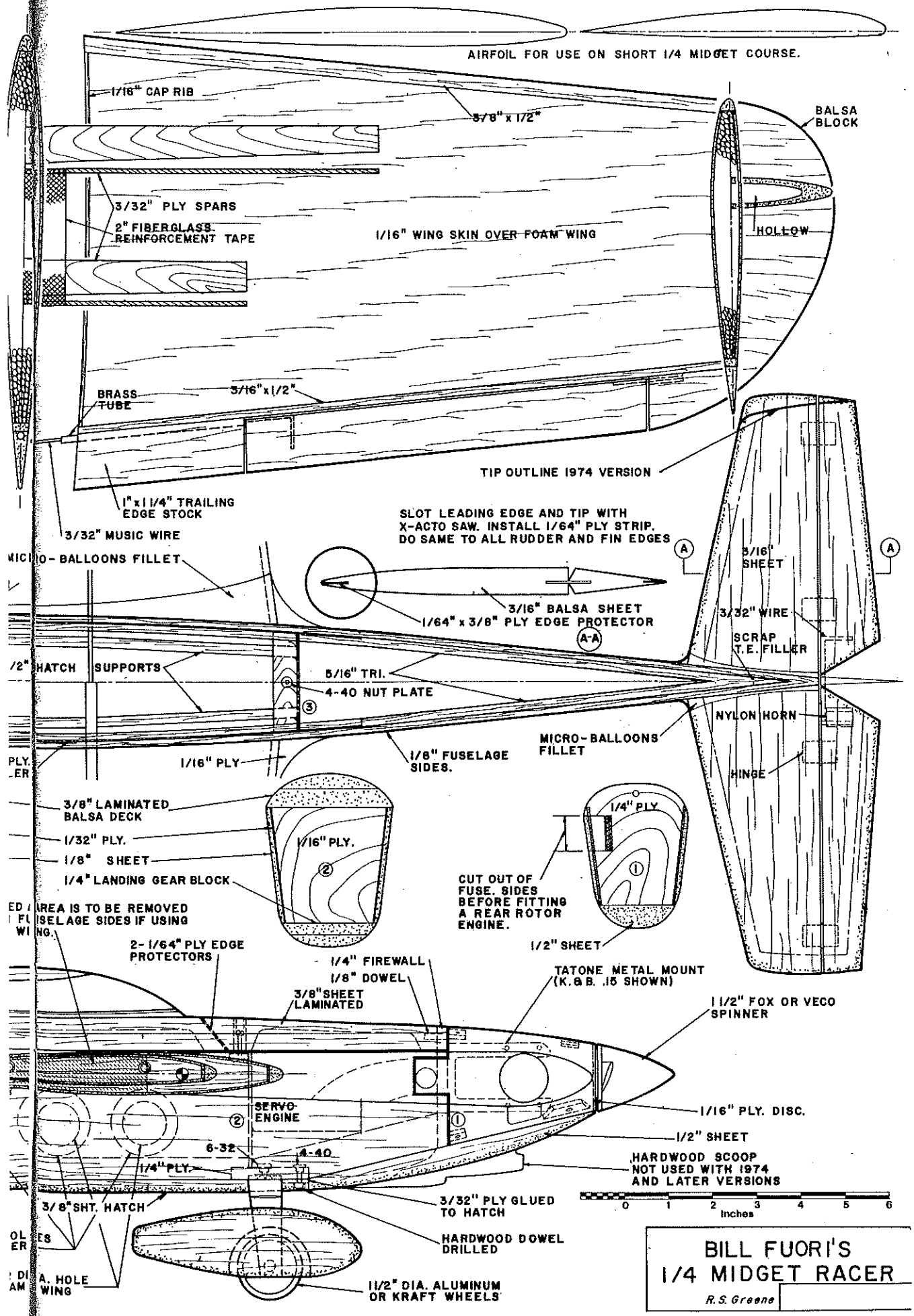


Quarter-inch plywood serves as the rear floor of the tank compartment and as a mounting platform for landing gear (rear holes) and lower hatch (front holes). Upper hatch provides quick and easy access to tank and throttle servo for inspection and adjustments.



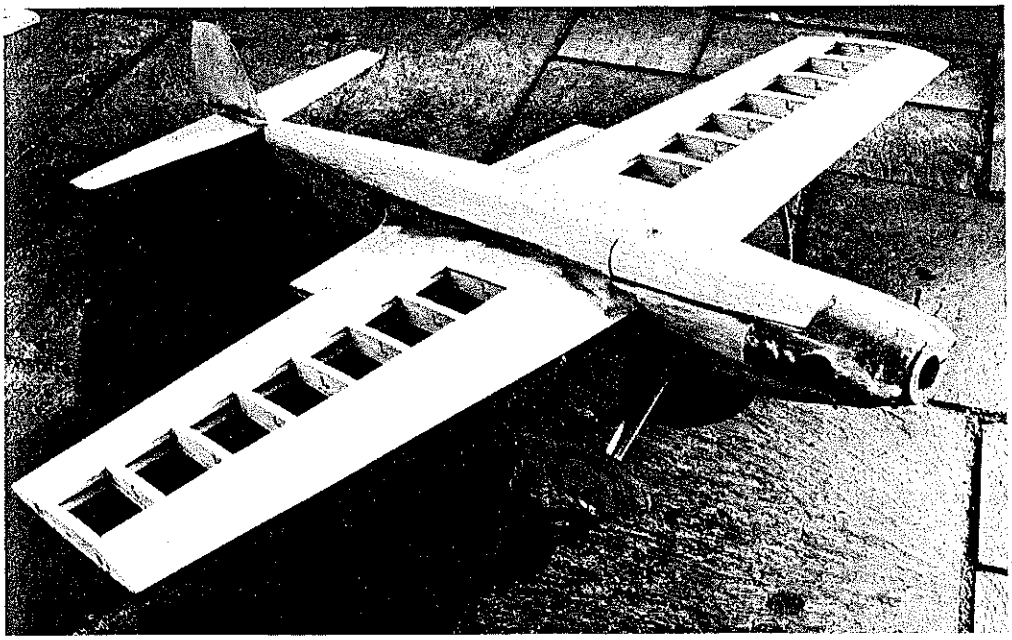
Aluminum carrying case (48 x 48 x 10") for those long trips. To date, no airline has refused to accept it as luggage and they will provide special handling if arranged for in advance.


1/16" SHEETING AND CAPSTRIPS TOP AND BOTTOM
1/16"x 5/16" HARD BALSA OR BASSWOOD STRIP.
3/32" RIBS
ARROW SHAFTS
RAY COTE'S 1974 VERSION TIP OUTLINE
HOUSE OF BALSA SHOESTRING WING KIT MODIFIED
3/16"x1/2" HARD BALSA
NOTE:
AILERON THROW 3/16" UP AND DOWN.
ELEVATOR THROW 1/4" UP AND DOWN.
RUDDER THROW 3/8" LEFT AND RIGHT.
1/2" ROCKET TUBE ENDS HERE
SOFT BALSA BLOCK
1/64" PLY EDGE PROTECTOR
1/16" PLY. DISC.
FIBERGLASS COWL
3/4" TRI.
1/2" TRI.
NUT PLATE
6-32
4-40
1/4"x1/2"
SOFT BALSA BLOCK
1/4 PLY. FIREWALL
1/32" PLY. DOUBLER
1/2" ROCKET TUBE FOR DUCT TO CARB IF REAR ROTOR ENGINE IS USED.
1/16" PLY.
RUDDER OUTLINE 1974 VERSION
NOTE:
USE 4 OZ. SULLIVAN SLANT TANK.
SEE STAB DETAIL (A-A)
3/8" SHEET LAMINATED AND HOLLOWED
MICRO-BALLONS FILLET
BALSA FILLER
SCRAP T.E. FILLER
MODIFIED DUBRO AILERON BUSHING
1/16"x3/8"
TRIANGULAR STOCK
1/32" PLY DOUBLER ENDS HERE
AILERON HORN
2-SERVOS
3/32" PLY.
NYLON HORN
OPTIONAL TAIL SKID
1/4"x1/2" BALSA
3/16" SHT. BOTTOM
HARDWOOD DOWEL DRILLED OUT FOR SCREW HEAD.
1/4" BASS OR SEMI-HARD WOOD GLUED TO HATCH
3/8" BALSA
1/16" PLY.
CUT BALSA AND PLY. PARTS TO SAME OUTLINE CUT WHEEL WELL IN BALSA PARTS CEMENT TOGETHER WITH EPOXY.
LIGHTENING HOL IN PLY DOUBLER ONLY.
USE SMALLER DI SIZE WITH FOAM

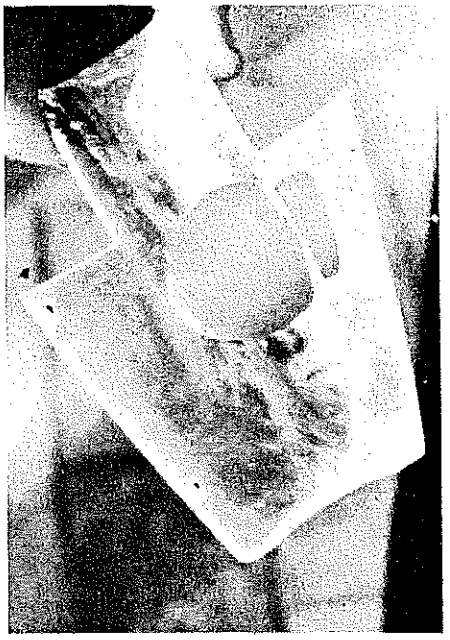


BILL FUORI'S 1/4 MIDGET RACER

R.S. Greene



Basic structure lacking only elevators, ailerons, and wing tips. Note large wing fillets—a key factor in reducing drag. Fuselage, rudder, and landing gear assembly are primed and painted, wings and stab are covered with Solarfilm or MonoKote.



Fiberglass cowl is simple to construct and not subject to melting and cracking as are vacuum-formed plastic cowls.

Bill Fuori's Quarter Midget

When this has dried, mark the location of the left cheek cowl and rough shape this block, being careful not to touch the marked cowl area. The bottom of this block must be cut so as to form a straight line with the lower edges of the fuselage sides.

The inside of this block now may be hollowed out to allow for the particular engine and mount. The ½ in. lower nose block is now glued on. A ¾ in. block or laminated ⅜ in. blocks are then tack-glued to the top of the fuselage from former 1 aft. Another such block is permanently glued to the top of the fuselage and to the front of former 1. Sand these blocks as close as possible to their final shape.

Now mark the position of the fuselage sides and formers on the rear top block from inside the fuselage. Cut this block with a razor saw to separate the tank compartment hatch from the top deck. Remove these blocks and hollow out as per the plans. A 1/64 in. ply edge protector is now glued to the rear of the hatch and the front of the deck. These blocks now are set aside until after the wing has been constructed.

Foam Wing: The foam-wing version follows standard construction techniques. Cutouts should be made for the plywood dihedral braces prior to covering the wing. Each panel is then covered with 1/16 in. sheet and fitted with leading-edge, trailing-edge, and tip blocks. Be sure to groove the T.E. at the root to accept the 1/16 in. ply fillet support.

The area marked out earlier on the fuselage sides is now removed. Two pieces are then removed from the wing center section to allow the wing to sit snugly into the area just removed from the fuselage sides. Allow room for the stub ribs at the wing root. Install the stub ribs. The two ply braces are then installed and the wings joined. Fiberglass should be used to reinforce the center section. The wing is then glued to the fuselage.

Built-Up-Wing: The wing ribs first must be cut out. This is easily accomplished by cutting out plywood or aluminum root and tip templates with holes for the arrow shafts. Eighteen 1 × 9″ balsa rib blanks are then cut out of a piece of 3/32 in. sheet and two ¼ in. holes drilled in each for the arrowshafts. Nine blanks are then sandwiched between the ply or aluminum templates and held in place with two-in. ¼-28 bolts and nuts. Care must be taken to ensure that the alignment of the tip and root templates is as shown on the side view of the fuselage.

The blanks are then block sanded so that there are no lumps or gulleys between corresponding points on the root and tip templates. The ribs are then separated. the beveled top and bottom edges of the ribs are then squared off. These ribs can be copied individually, or the entire process repeated for the other wing panel. If one is modifying a House of Balsa Shoestring kit, the same procedure can be used to reshape the kit ribs.

The fuselage and rib locations are then marked on the arrowshafts. The fuselage is placed inverted on a flat surface with former 1 protruding over the edge, and the arrowshafts slid through the holes in the sides. The ribs are then placed in their respective positions on the arrowshafts. The arrowshafts are supported at each tip by a ¼ in. dowel placed parallel to the tip rib. The shafts should rest unrestrained on these dowels. The root rib on each panel is then glued to the fuselage side and to the arrowshaft. Be careful to place a glue fillet around each shaft inside the fuselage. When this has dried, epoxy each rib to its marked position on the arrowshafts.

Install a 1/16 × 5/16″ hard balsa or basswood strip to the leading edge and a 3/16 × ½″ balsa strip to the trailing edge of each panel. Check to see that the strips are straight from root to tip with no bows. The leading-edge strip should be flush with the ribs whereas the trailing-edge strip should extend above and below the ribs. The remainder of the wing construction is straight forward. Care should be taken when sanding the wing as the total area shown is extremely close to minimum specifications (300 sq. in.).

Fuselage—Part 2: The top hatch now is taped on to guarantee correct alignment of the top deck. The rear top deck and 3/16 in. bottom sheeting are then glued to the fuselage. The ply landing gear platform and hatch supports are epoxied in. The bottom hatch is cut from ¼ in. balsa sheet. A ⅛ in. dowel pin is installed in the top hatch and ¼ in. dowels are inset in each hatch and drilled out for the hold-down screws. The screw heads should be recessed. With the lower hatch screwed on, the lower half of the fuselage may be sanded to shape.

The cowl blocks are then cut to shape and hollowed. Before glueing the left cheek cowl, make certain that the ½ in. rocket tube (to channel air to the carb) has been installed and lines up with the hollowed left cheek cowl. Before attaching the right cowl, a balsa block is carved to shape and placed (not glued) between former 1 and the 1/16 in. plywood spinner ring. The right cheek cowl then is glued to the fuselage and this block, except for a 1 in. area back of former 1. When dry, the cowl is cut off with a razor saw one inch back from the front of former 1, and the balsa plug removed. This is used to make a plaster mold for the fiberglass engine cowl.

Tail and Undercarriage: The tail parts are cut from 3/16 in. balsa sheet. A ⅜ in. groove is cut in the outside edges of these surfaces with a razor saw. Strips of 1/64

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Bill Fuori's Quarter Midget

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× 3/8" ply are glued into this groove to protect the edges of the surfaces. The surfaces then can be sanded to shape as shown on the plans, and the elevators and lower portion of the rudder cut off and hinged. The rudder and stab are then epoxied to the fuselage. A canopy is added, making certain that a minimum fuselage height of 5 in. is maintained. Fillets then are installed on the wing, tail, canopy, and cowls, using microballoons.

The wheel pants now are constructed and the entire airplane is final sanded. It is suggested that the aluminum landing gear struts be filed to an airfoil shape, particularly at the leading edge. The fuselage, rudder and wheel pants should now be given a coat of resin and a coat of epoxy filler with a sanding after each. The fuselage is then given one light coat of epoxy paint. The wing and stab should be covered with Monokote or Solar Film.

Equipment: I have found that coupled aileron and rudder works fine without problems. Therefore, it is only necessary to have two servos within the fuselage—aileron/rudder and elevator. The engine servo is mounted in the tank compartment to the right side of the fuselage. For proper balance, the receiver and battery pack should be mounted against former 2. The tank is a four oz. Sullivan slant type.

Flying: The airplane will prove to be responsive but stable if you adhere to the CG location and control surface deflections indicated on the plan. I find that, with this set up, it will turn on a dime without the slightest snap roll tendency. The tightest of turns will cause no structural damage if the all-up weight of the model does not exceed 3¼ pounds. However, if your plane weighs more than this, I would suggest that you do not whip, but smoothly and gently turn pylon 1. The five of these ships that I've built (all still in existence) ranged in weight from the 40 oz. to 42 oz. Well, I guess that's about it, the rest is up to you, your engine, and your radio.

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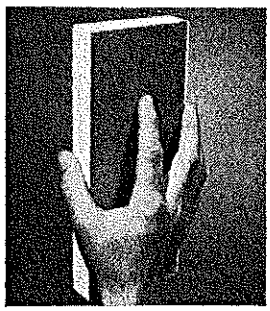

Sanding Blocks: Ideal for sanding large areas, such as wings, stabs, fuselages, etc., new sanding blocks have high-quality 3M open coat sandpaper bonded to high-density foam block. Available in three grits, size is 9 x 3-3/4", 89 cents each. From **Prather Products, 1660 Ravenna Ave., Wilmington, Ca. 90744.**

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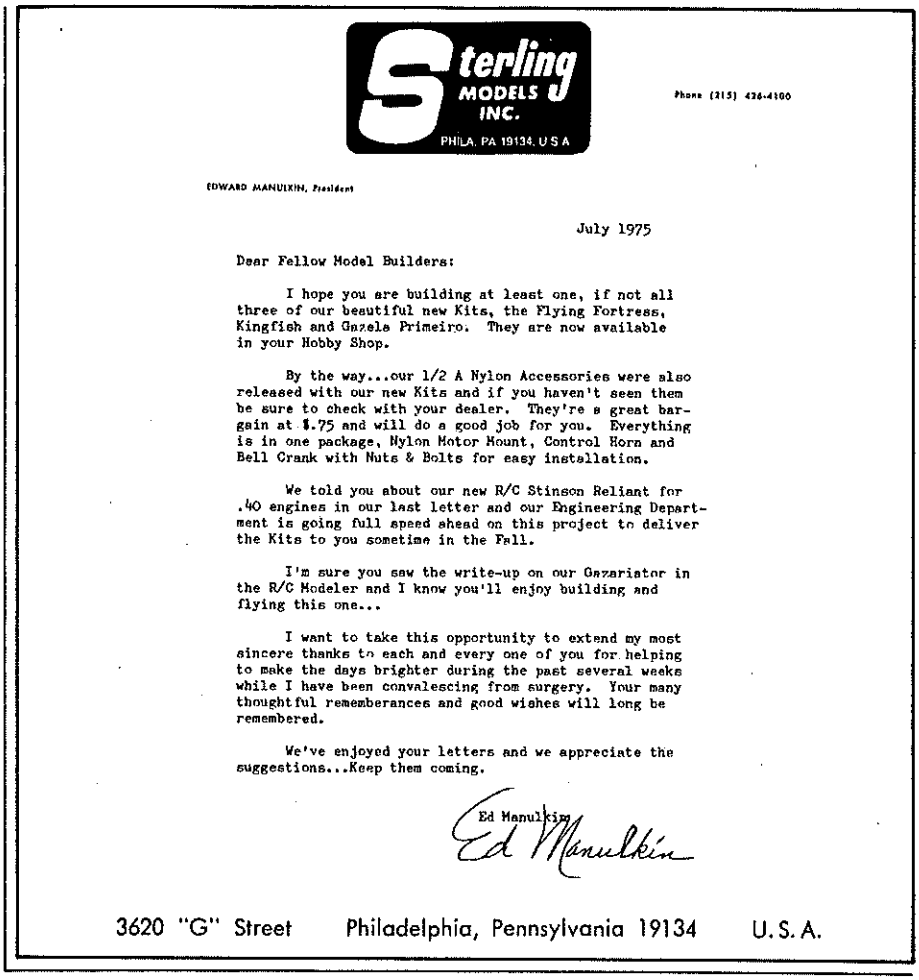

Sterling MODELS INC.
PHILA. PA 19134, U.S.A.

Phone (215) 426-4100

EDWARD MANULKIN, President

July 1975

Dear Fellow Model Builders:

I hope you are building at least one, if not all three of our beautiful new Kits, the Flying Fortress, Kingfish and Gazela Primeiro. They are now available in your Hobby Shop.

By the way...our 1/2 A Nylon Accessories were also released with our new Kits and if you haven't seen them be sure to check with your dealer. They're a great bargain at $.75 and will do a good job for you. Everything is in one package, Nylon Motor Mount, Control Horn and Bell Crank with Nuts & Bolts for easy installation.

We told you about our new R/C Stinson Reliant for .40 engines in our last letter and our Engineering Department is going full speed ahead on this project to deliver the Kits to you sometime in the Fall.

I'm sure you saw the write-up on our Gazaristor in the R/C Modeler and I know you'll enjoy building and flying this one...

I want to take this opportunity to extend my most sincere thanks to each and every one of you for helping to make the days brighter during the past several weeks while I have been convalescing from surgery. Your many thoughtful rememberances and good wishes will long be remembered.

We've enjoyed your letters and we appreciate the suggestions...Keep them coming.

Ed Manulkin

Ed Manulkin

3620 "G" Street Philadelphia, Pennsylvania 19134 U.S.A.

FF Indoor

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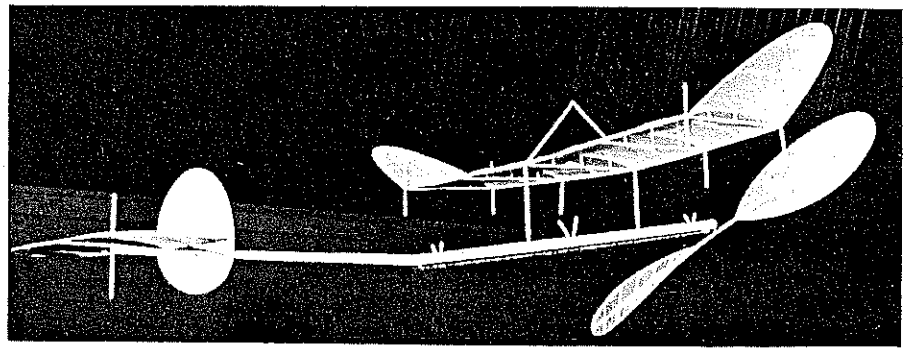
cial, and not everyone agrees on how much pitch is too much. The most important thing is to have enough pitch. Luckily, it is fairly easy to determine if the prop pitch is too low for any particular model. Simply measure the rpm just after the model stops climbing. As a general rule, the properly adjusted microfilm model, even a heavy one, should have cruise rpm between 45 and 55. Lighter models will (or should) have the lower range of rpm.

How to Measure RPM: Indoor props, except for PennyPlane and Easy B, usually turn slower han 80 rpm and some go as low as 35 rpm. That is, you can *see* the prop turning. The most common method of measuring rpm is to time how long it takes the prop to make 10 revolutions. Begin the count with "O" as you start the watch, count "1" the next time the *same* blade comes up (count only every other blade) and continue to 10. Count "10" just as the blade passes the start position for the 10th time. Divide the time in seconds into 600 and get rpm. For example, 8 seconds for 10 revs is 600/8 or 75 rpm. That's too high. Strive for 12 seconds (48 rpm) or even 15 seconds (40 rpm).

Sad But True! This reporter has never been able to understand why most indoor activity around the country comes to a halt in the summer. During warm weather, the models fly better, the rubber works better (rubber output is proportional to temperature), and it is always easier to handle fragile models with warm hands! Nonetheless, only Miami, Fla., modelers and those who fly indoor in the blimp hangers at Lakehurst, N.J., have summer activity. The Miami fliers have about 10 months of activity a year, and the hangars have good conditions only during the summer. (My address is: PO Box 545, Richardson, Texas 75080.)



Tricks of the trade—the bent fuselage design by Stan Chilton gives his model a high thrust line with an otherwise normal layout. Other structural details show up clearly.