



Author with some of Bonzo's winnings. Note resemblance of trophy planes to the actual model. Clean finish with attention to details important part of any scale winning entrant.

## BONZO

Steve Whitman's Bonzo would appear to be an unusual free flight scale subject. Not so, though, as its contest record shows '67 Open Nats Champs to its credit.

Low aspect ratio, coupled with mid-wing make its contest winning record even more impressive.



► When people first hear of Steve Wittman and his plane, Bonzo, little do they realize that for nearly twenty years this little yellow racing plane has been dusting the pylons whenever and wherever a Goodyear or Formula One Race has been held. The man and the airplane have done much to keep grass roots air racing alive and kicking since World War II.

Like every good designer, Steve Wittman has continually sought to improve his product to the point of highest efficiency. The result of this effort has been rewarding. Bonzo has placed high in every race it has completed. It proudly carries the race number ONE for all to see.

Bonzo's basic design has not been changed since its first flight. Minor improvements that can be detected through a study of published photographs include such things as addition of wheel fairings, some air intake shape and size change to improve engine efficiency, and a slight reduction of area in the vertical stabilizer. These are the only visible changes, indicating that the original design is basically sound.

My interest in Bonzo as a free flight flying scale subject began about eight years ago. Each time I talked about Bonzo to my fellow club members, they gave the usual encouragement; "Rots of ruck", "Hope it won't make too deep a hole", and such other hopeful hints. Fired by their confidence in my choice of subject, I set out to find the information to make my model. The more I looked at published three views and other data, the less they would agree. I found it was necessary to begin compiling a composite three view from those existing plus using pictures and written information about the plane in order to make a useful three view.

After getting well into the drawings for the actual model at one size, it became evident that a larger model would be necessary. This, along with the routine of earning a living slowed down the project for a couple of years. Finally, after collecting additional information, the urge became too great to resist and the project was begun late in 1965 with hopes of completing in time for 1967 NATS at Los Alamitos.

The NATS are now history and Bonzo is part of it, for the model took first place in open free flight flying scale. Later in the NAA Flightmasters 18th annual event, Bonzo won second place in free flight flying scale and also won first in fidelity to scale.

From the first glide tests through taxi and first powered flight, before completing the paint job and details, the model performed beyond my fondest hopes. Close attention to weight control and use (Continued on next page)

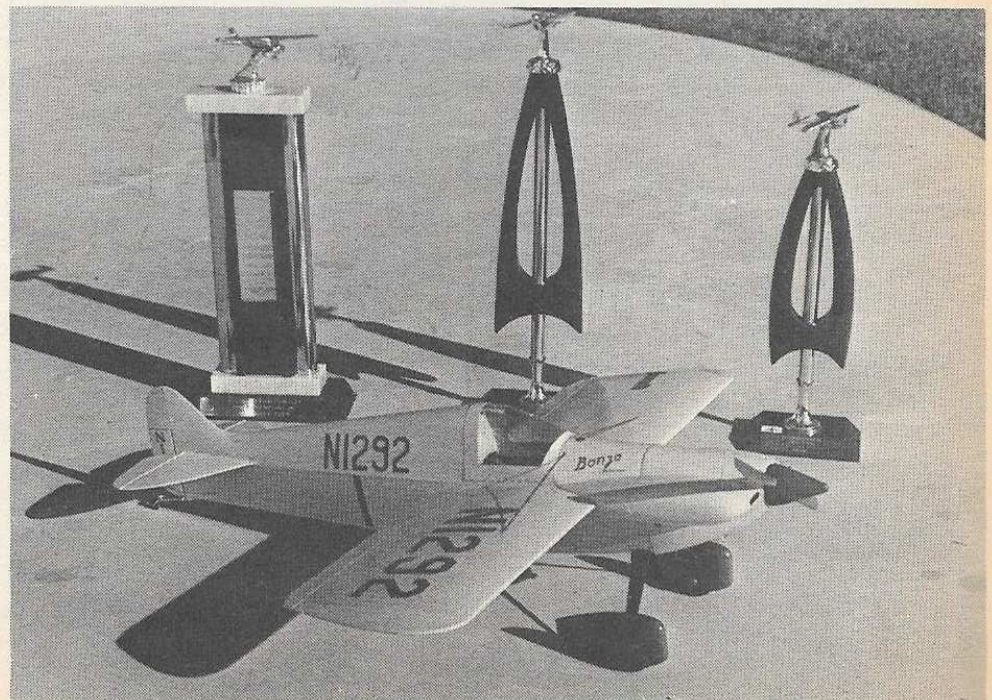
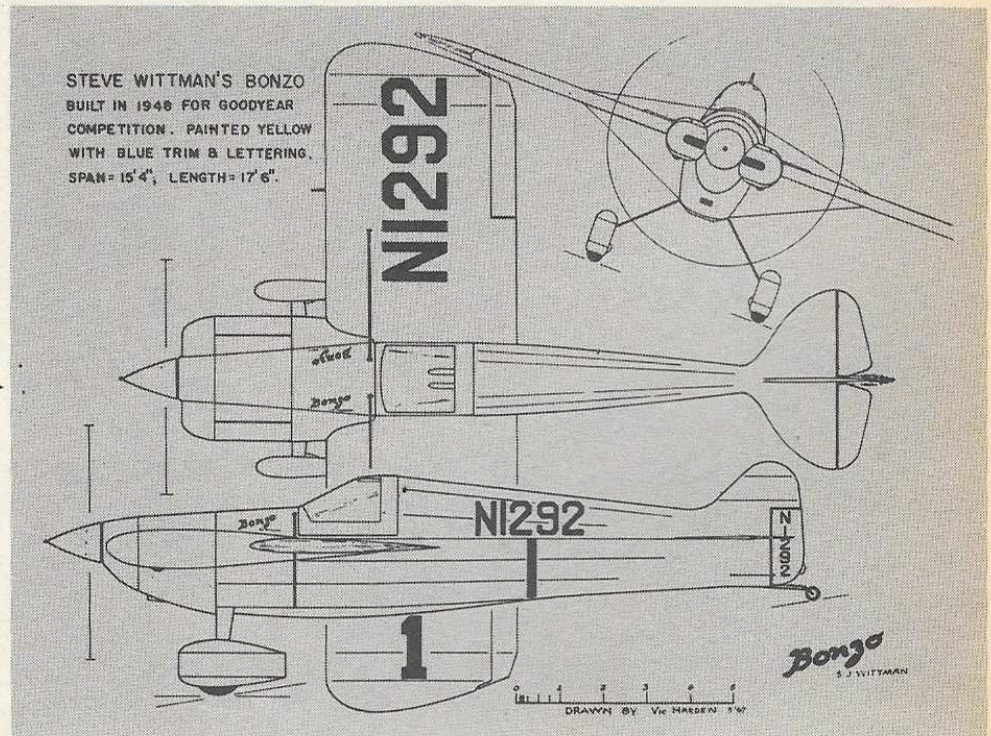


Note reflection of sun on wings. Finishes such as this made it possible for the Bonzo to win first in NAA Flightmaster's Fidelity to scale.

## BONZO . . . continued

of simple jigs to control all surface alignment are the secrets of the model's success. You can have the same success with the model by exercising the like care in its building. Before beginning construction, be sure you understand the plans. Go over each view and find how the model is assembled, what materials you will need, and how you will use them. Try to do some new thing that you have not done in building a model before. By following this system of study and organization, you will learn new things and how to do the necessary work, thus improving your own over all skill and knowledge as you go.

Much of this model is the usual balsa and glue type thing and will go together easily if the parts are cut to the line as shown. Such things as wing ribs will require a template, best made of metal such as that from a gallon can, cut and filed to the proper shape. New items you might not have, like the sheet aluminum, can be obtained at any reasonably sized airport where private aircraft are repaired. Go on a search to the airport and talk to the people there. Show them what you want to do; maybe take the portion of the model that is complete. You will be pleased by the interest most of the airport people will show, I am sure. Remember you are interested in aviation or you wouldn't be building models, so what better way to get to know aviation's people? Another way, if the airport is not obtainable to you, is to go to the library in your town and ask for recent issues of aviation magazines. Look in the advertising section for one of the supply houses advertising materials for home built aircraft. Select one near your area and write a letter asking if they can supply you with the sheet aluminum material you need. Tell them the size, thickness, and grade. Two pieces about 8 x 12 of .012 2024T will make the canopy and wheel pants (Cont on page 57)



Another view of the sleek speedster with its trophies. Nats trophy, left; Flightmasters, other two.



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is easy if you take your time and don't try to hurry. Use .032 soft aluminum wire for the rivets. The holes take the longest drilling; I did my drilling with a pin vise, by hand. Always remove the burr at the hole by hand twisting a larger drill on both sides of each piece at each hole. Check fit all metal parts before riveting by clamping together after drilling to be sure parts will be straight when riveted. After riveting you can file off the excess. Don't try to beat rivets flat because the metal around the area will be stretched and deformed. Another item I suggest is to glue two pieces of 1/32 plywood together to form 1/16 thickness which gives a much stronger part and eliminates the need for two sizes of material. Covering the model with Jap tissue and doping at least two coats of clear dope is recommended. Covering the entire fuselage and tail surfaces with light weight silk will give an excellent base for your finish work; this includes the spinner, wheel pants, cowl and only the wing tips will require silk covering over the jap tissue. The block balsa should be on the soft side of medium to hold up well and still be light weight. Always pre-glue all joint areas for a strong, long lasting airframe.

### CONSTRUCTION:

Assuming you have studied the drawing, determine the engine you will use, and have all the necessary materials at hand, let's start on the fuselage. Begin by cutting out the bulkheads F-1 through F-19 to the patterns shown in the section views. Now prepare the two fuselage sides from 1/16 sheet balsa, marking the bulkhead locations on inside face and stringer locations on outside face. Mark a left and a right hand part. Cut out F-20 doubler plate (two required) from 1/8 sheet balsa. Glue

F-4 and F-20 doublers to each side sheet. Glue F-1 and F-3 together holding them on centerline. Position both side sheets into place at F-1 and locate F-11 canted bulkhead to its mark, gluing the sides in place. Add the 3/32 sheet floor into place between end of F-4 and aft to F-11. The best procedure for this assembly is to invert the unit and align it to the edge of the work table to hold the sides and F-1 bulkhead square to one another.

When the glue is dry on this unit, glue the forward closing bulkhead of 1/16 sheet balsa to the aft edge of F-4 doublers from the floor up to the top of each side. Glue on the half round basswood strips to the inside face of the sides to stiffen the side sheets and represent tube structure. Now place F-8 and F-10 wing tongue pieces made of 1/32 ply through the fuselage. The slots in F-20 locate the position for these tongues. Be sure that F-20 is made as accurate as you can since the performance of the model depends on the wing position and F-20 will locate the wing position. Intall the 3/32 balsa tongue stiffeners and the 1/16 balsa doubler at the F-8 location.

Holding the forward portion of the fuselage, the aft end of the side sheets can be tapered and glued so that the top edges are in line with each other and on centerline. Now glue the three aft fuselage bulkheads into place at the locating marks. Cut the bottom 1/16 sheet balsa with the grain running across the fuselage width to fill between F-11 and F-19, then run the grain lengthwise aft of F-19 to the tail post. Now is the time to really check the center line of the assembled unit. Be sure that your side members curve the same aft of F-11 bulkhead back to the tail post

(Continued on page 60)

### Bonzo

(Continued from page 14)

I am sure you will find you can make all the parts without problems. The riveting

## Bonzo

(Continued from page 57)

at the upper and lower edges.

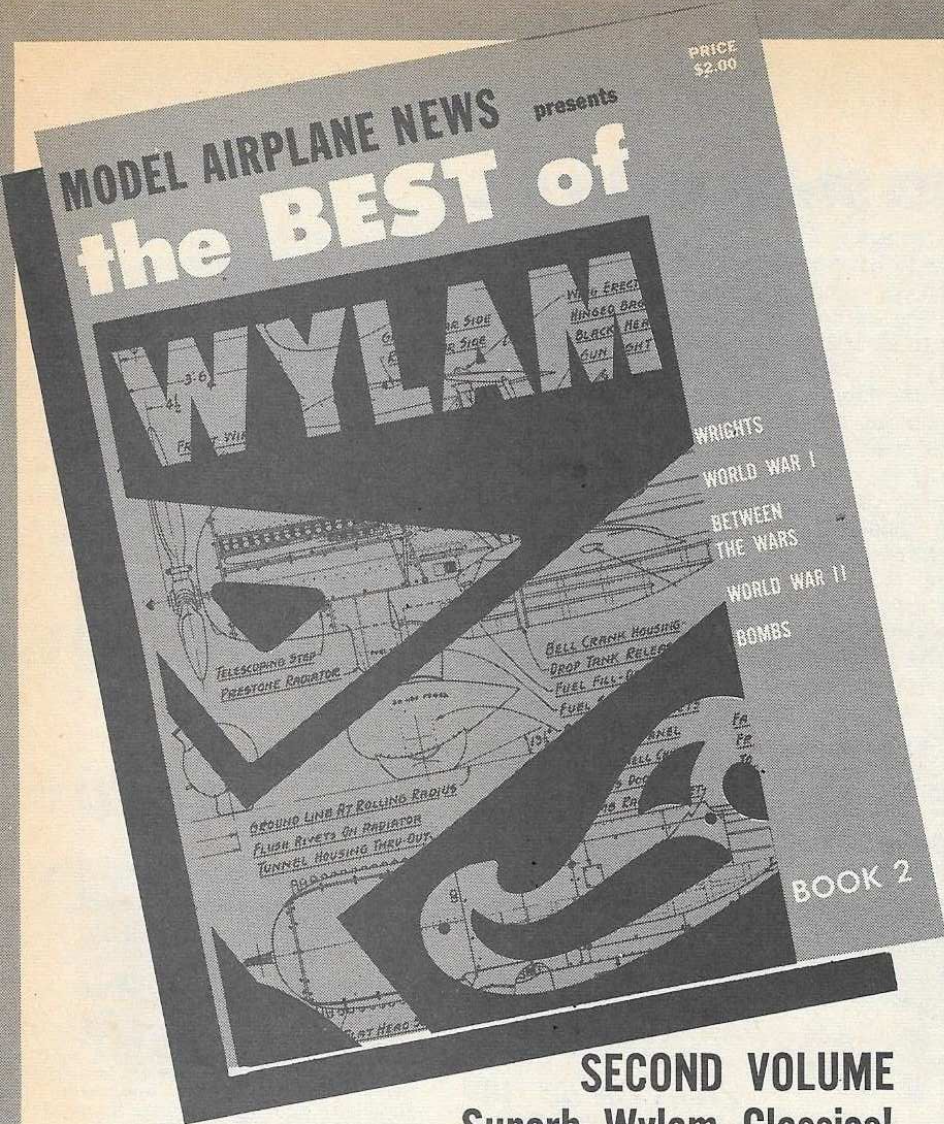
Cut the horizontal and vertical tail surfaces from 1/8 sheet balsa and glue basswood spars in place. Form the airfoil tapers as shown on side and top views of the plan. Mount the horizontal on the fuselage aligning with the horizontal and vertical center lines correctly. Now install the vertical stabilizer in its position and locate formers F-18 each side to brace the vertical. Now the tail surfaces are in position and aligned and the turtle deck formers F-9, F-12, F-14, F-16 and F-18 in place. Glue on the basswood stringers from the head rest to the lower edge of side sheets as shown. Next install F-5 belly former and the two F-7 fairing strip formers with their basswood stringers.

Install F-2 and F-6 formers into place. Locate the two 1/8 balsa tube supports on forward face of F-6. Glue in the two flattened 5/32 aluminum tubes for the landing wire guides leaving them long enough to extend beyond the 3/32 sheet balsa covering. Glue on planks of 3/32 sheet balsa to cover the upper cowl section. File the aluminum tubes to fair with cowl contour. Cut the two balsa side cowl fairing blocks for each side of fuselage. Fit both blocks to match F-20 doubler face, F-1 former and F-8 wing tongue and glue into place. Do not cut the wing airfoil shape out in the blocks until the wing is made and can be used for the exact location of the cuts. While you are cutting balsa blocks, the head rest turtle deck block should be fit into place from F-9 to F-18 and glued.

Now it's time to start on the cowling blocks. The first step is to make light cardboard templates of the side or cheek cowl pieces and the upper and lower cowl contour. You will need a pattern of the rear view outline of the cowl and also one of the nose block. At this point, cutting of the blocks as accurately as possible is a must. Therefore, use a great deal of care in establishing the center lines and the ends of the cowl blocks. Refer to the exploded view of the cowl assembly for grain direction and method of cutting the blocks to shape. When the square cut blocks are done, assemble them with small glue spots. Mark the center lines all the way around the assembly, then glue the rear cowl template to the assembly and C-1 1/32 plywood ring to the front in line with the center lines. Check to be sure assembled block is large enough to match the fuselage at the F-1 bulkhead. Now locate the 5/32 aluminum tube aligning pin holes in both the fuselage and the cowl. Cement tubes in place in the fuselage through F-1. Carve the cowl to faired contours and sand smooth.

With the cowl block completed, you must choose the motor mount method that best suits the engine you intend to use. I used 1/32 plywood and 3/16 basswood corner blocks on the one for my ship. The mounting face is of 1/32 plywood glued up to form 1/8" thickness. A Tatone type engine support with a tapered thrust adjuster spacer seems to work out best for me. The surfaces of the mount can have circle cutouts and the fuel tank mounted in one opening to suit your engine.

Now that the engine is in place and the cowl is carved to shape, the only thing left is to make room for the engine inside. Remove the upper hatch portion of your cowl block assembly. Carve the inside of lower cowl approximately as shown on the plans in the various views. Do not try to cut it too thin; work out the thing in steps. Clear the engine mount first without



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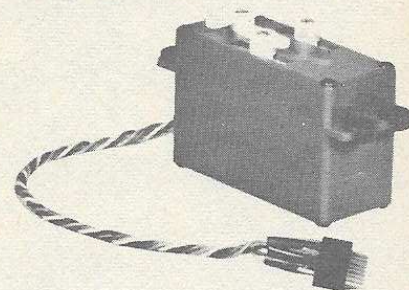
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the engine, then slowly cut out the nose block section as required to clear the engine, then slip the cowl into place on its aligning pins and fit the upper hatch by carving out the inside as necessary. Locate and insert the aluminum tubes and hardwood dowels for the hatch cover hold-down. Glue on the paper clip wire air intake opening reinforcement. Form the wire clips and cowl retainer hooks as shown, cementing them into place. If all is faired and will match your contour templates, set it aside until covering time.

Now the landing gear unit can be made up starting with the two 1/32" plywood mounts cut to size fitted to the opening in lower forward fuselage and seated against the ends of F-4 gusset and flush with lower edge of fuselage sides. Locate and drill holes for the two 2-56 bolts, brass spacer tubes and nuts. Assemble, gluing the plywood and hardwood block as shown on plans. Insert a 1/8" balsa plate between F-3 and F-4 gussetts. Provide a cutout for the nuts on mount plate and glue in the opening; then glue the mounting plate in place. Make up the landing gear strut to the pattern and bend at bend lines shown to match front view on plans. Cut 3/32 hard wire for axel and braze it into steel washer. Do not overheat the wire because it will draw out the temper. Hold wire in a large bench vice while brazing so only the brazed end is affected by the heat. Drill and rivet the axel and strut assembly and if you are going to install the wheel pants be sure to assemble the .012 aluminum inboard support plates when you build up this assembly.

Assuming you are installing the wheel pants on the model, it will be necessary to make the wheels as shown on the plans. The problem of so much weight forward dictates light wheels of balsa with wheel

pants installed. The model can be flown in contests without wheel pants, if you desire, since Bonzo did compete for two years without wheel fairings. But then the markings will have to be changed to agree with the actual appearance of the airplane at that time.

Make up the tail wheel fork and the spring leaf from metal. Mount onto the fuselage and cement into place with strips of silk covering material at tail post area. Make the rudder assembly installing it with pieces of wire from paper clips located at the hinge locations shown.

Now some head rest carving and sanding to fair the contour will improve the looks of things. Round off the edges of the basswood stringers carefully and fair in the side cowl extensions with the upper cowl. Check the general alignment and shape to the plans. If you are happy with your handiwork, then give the whole thing, including the cowl, a couple of coats of sanding sealer and get ready for inside scale stuff.

Cut out a piece of aluminum foil and cement it to the floor surface. Paint entire inside with zinc chromate primer. Make up a set of rudder pedals and brake cylinders with pedals from aluminum tubing. Locate and cement them in place as shown on plans. Easiest way is to mount the brake assembly on a piece of 1/32" balsa and paint the wood with zinc chromate primer and glue the assembly to the wall. Next make up the seat base and control stick assembly. The seat base is 1/32" balsa with 3/32" balsa front support through which is attached the stick assembly made from aluminum tubes. Make your seat and back rest cushions from foam covered with a light grey material. Make shoulder harness and lap belt from white shoe laces and the metal fittings out of wire

from paper clips. Locate and cement them in place.

Next the instrument panel is cut from .012 aluminum sheet with cutouts for each instrument. Obtain photos or draw your instruments on scratch board, then mount cellophane over the instrument face and glue to the metal panel. The panel can be dented from the backside in the positions of the screw locations to give a more realistic appearance. Mount the panel into place using the throttle knob and primer handle shafts as attaching pins. At this point, fit and glue the cockpit rail basswood strips between F-6 and F-9 to seal the edge of the structure in way of the cockpit opening. Paint them cub yellow.

The wing panel assembly is not difficult or unusual but care must be used to insure that the necessary washout is built into each panel correctly. The plan shows a view of the trailing edge of the wing. Both sides must be made with this amount of twist when completed. Set the lower rear spar position so the outboard end is 1/8" higher than the inboard end and the front spar is level. Glue ribs and spars together, then put the lower skin into place over the jig and glue the rib spar assembly to the skin, then glue trailing edge into place.

At this point, the wing panel will be rigid enough to handle. Fill in the space between upper and lower spar caps at W-3 rib and first W-4 rib at front and rear spar. Also add 1/32" plywood doublers on outboard face of W-3 at the point where tongues pass through. Fit a filler at flying wire pin location between upper and lower spar caps. Install .020 wire hook and hardwood dowel into location shown in front view on plans. Add 1/8" balsa doubler to hold hooks in position. Glue W-1 and W-2 into place against W-3 rib. Make and install the wire hooks at forward and aft

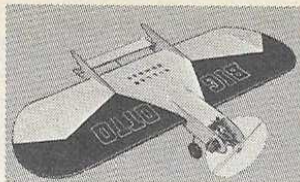
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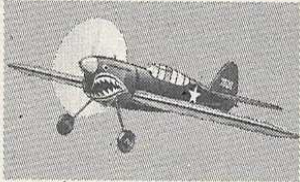
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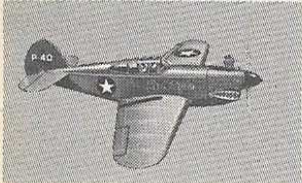
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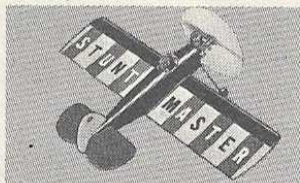
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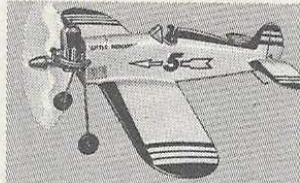
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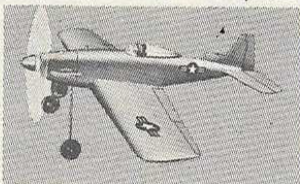
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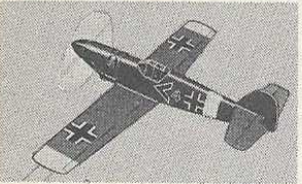
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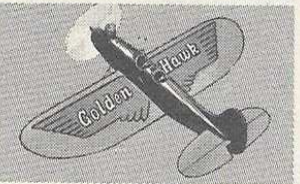
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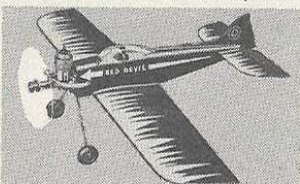
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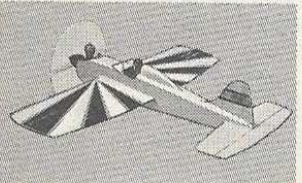
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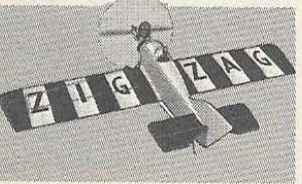
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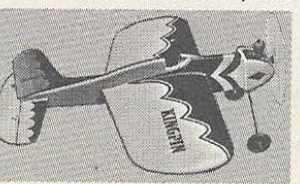
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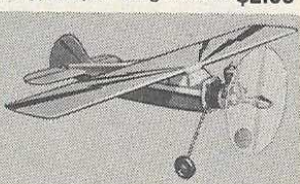
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wing tongue locations. Make and locate W-6 wing tip formers of 1/16" sheet balsa, gluing between leading edge and aft spar. Reseat the panels onto jig to assure holding the required washout twist in the assembly. Complete the covering of the upper surfaces with 1/16" sheet balsa.

Remove panels from jig and install W-5 rib on W-6 wing tip former. Glue the upper and lower spar caps into their slots. Cover the tapered section between end W-4 rib and W-5 rib top and bottom with 1/16" sheet balsa. Bend basswood tip pieces over a contour template after soaking in boiling water and let them dry. Fit and trim tip bows, then glue the laminations together and onto W-6 wing tip former. Complete carving and sanding to fair overall. Make up solid sheet balsa ailerons carved to carry out twist of wing at the trailing edge. Glue onto wire supports positioned to fair with wing contour.

Now is the time to cut the wing airfoil shape into the cowl cheek fairing blocks. Cut the outline with a knife using the wing panel located on wing tongue pieces W-8 and W-10. This will insure a good fit and matching cutouts with the wing panels.

Paint wing surfaces with two coats of sanding sealer. Now the whole model can be sanded smooth ready for covering with Jap tissue. Follow your own methods and past successes in covering with tissue and silk. After filling the silk with clear dope and sanding to smooth surface, apply the Cub Yellow color. About six coats should do it fine. Sand between every other coat. The final coat should be 50% clear and 50% color to provide a luster surface.

A few things are left; canopy, wheel fairings, and the spinner. The spinner is built to suit the propeller you need for your engine. Cut out discs C-1, C-2 and C-3 from 1/32" plywood. Glue soft balsa for nose section to C-1 and medium hard balsa to C-2. Drill a 1/8" hole through the parts and assemble on a long 4/40 bolt and turn part to the contour shown. With everything smooth and even, drill the two 1/16" diameter holes for aligning pins through C-2 and C-3 and marking C-1 for center of hole locations so the wire pins can be lined up with the tubes. Remove the bolt and complete internal carving to fit your prop and clear the prop nut. Install 1/16" aluminum tubes in C-2 and balsa long enough to pass through C-3 plate. Cement tubes into place leaving C-3 loose to permit propeller installation into spinner. Cement wire guide pins into place through C-1. Seal and cover with silk for finishing.

The wheel pants are next. Cut out the .012 aluminum side panels and the two outside axel support brackets, also the four bulkheads. Bend the bulkheads and brackets to shape and clamp pieces together. Drill rivet holes and burr countersink. Rivet the inside panels to the support bracket already on the landing gear strut and rivet the bulkheads into place. Now locate the outside support bracket on the axel stub and position outside side panel so the location of the support bracket can be made to the panel and drilled. Once this is done, rivet the support to the side panel, then install the wheel on the axel and rivet the side panel to the forward and aft bulkheads. Be sure your wheels will run free; adjust as necessary to obtain alignment and free running wheels. When this is done, glue on the blocks forward and aft of the assembly and put on the upper and lower block in their place and carve to shape. Remember, keep the wheel free to turn inside the assembly. Fair in and sand to final shape, blending in with the metal parts. Begin cementing silk pieces at all joints and low places to build up strength and hold parts together. When

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completely faired in and joints are smooth, cover overall with silk and seal for finishing. The spinner and landing gear assembly with wheel pants fairings are painted medium blue and finished to same luster as fuselage and wings.

The canopy is not as difficult as it looks. Cut out the .012 aluminum sheet to the template on plan leaving excess material on inside cutout until the part is fit to the fuselage shape. Begin bending at the forward or narrow end so that the edge will match the shape of the instrument panel former. Go easy, slide the material between your fingers, bending very slightly each pass, but forming an arc into the metal with the edge coming into a straight line when fully formed. Now using the same care, form the two ears along the head rest former edge and trim the edges to form a butt joint. Cut out the splice plate to pattern, clamp into place and drill and rivet together. Make the stiffeners and hinge shown on the plans, drill and rivet them in place matching the existing cockpit opening. Make the lock pin and rivet in place. Drill the lock pin hole in the cockpit rail to align with lock pin location. Mark and trim out the excess metal around inside of canopy frame. Cut out a clear plastic windshield piece to the pattern and fit it into place. Clamp, drill and rivet the plastic, being sure to keep the frame from twisting out of alignment during the riveting. With some care and a great deal of patience, you will have a really good looking job on your hands before you know it.

Now assemble the wings on the fuselage with rubber bands as shown. Set the ship up and align the wings level. Measure and fit the fixed length flying wires with "S" hooks at the lower end. When wires are in place, the leading edge should be a straight line from tip to tip. Now cut and drill landing wires to length with "S" hooks for upper center section rubber band. Assemble the two wires to the rubber band and feed one end through the opening in the cowl. Attach the ends to the upper wing hooks. While you are at it, make an extra set, just in case.

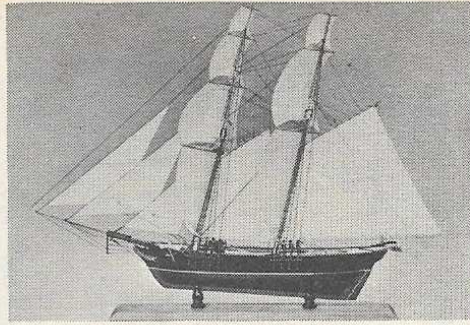
There it is, all set to test if you like. Get everything in and on; engine, prop, spinner and landing gear for the balance check. Add weight as necessary aft or forward to bring the model into balance at the center of gravity location shown in the side view. When you are satisfied that everything is in order, go out to your favorite flying spot for the checkout glide and maybe a first flight.

Before aiming at that tall grass, check all of the surfaces to be sure they are in neutral position and that the balance weight is in place before the glide test. Launch the model level as you run into the prevailing wind. This model flies at about 15 m.p.h. in a glide and must be released at about that speed. Hopefully all goes well and the model is ready for that first flight. Start the engine and set it at a low but smooth operating r.p.m. Release the model for an r.o.g. take-off into the wind allowing it to build up its own speed for lift-off from the runway. Watch this flight very carefully for any power flight adjustments to be made to correct any nosing up in a power stall or turning too much to the left. If these things happen to the model, adjust the additional side or down thrust to correct this condition and make another flight using a little more power. Continue checking and correcting in this manner until you reach full power for your engine. Now the model is tested and can be improved in detailing and finish as you desire. It is my strong recommendation that you get to this point at least a couple of weeks before that important

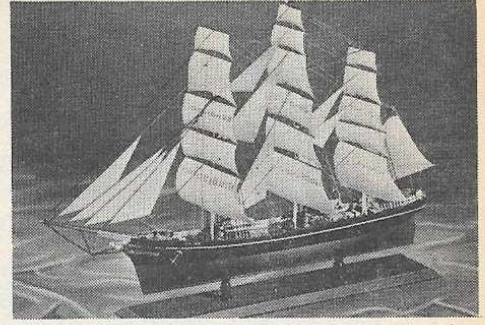
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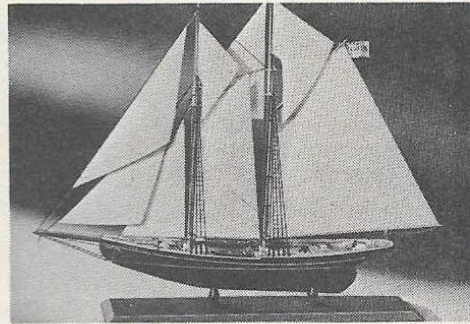
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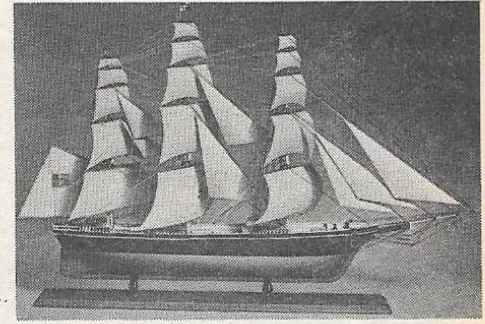
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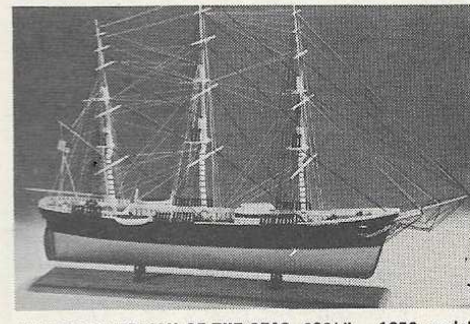
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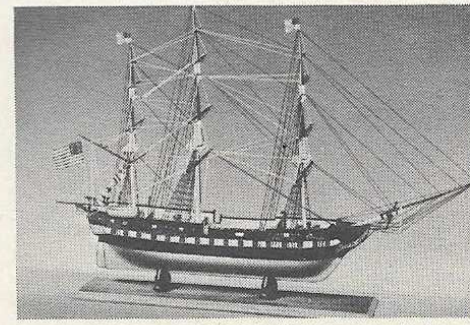
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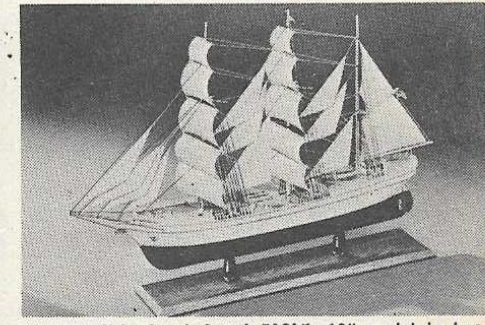
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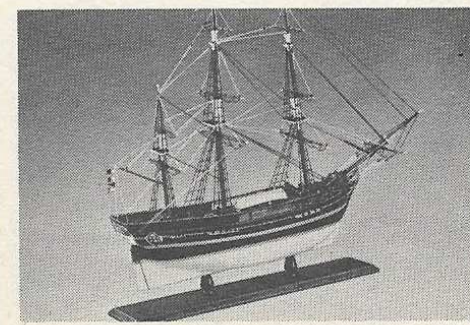
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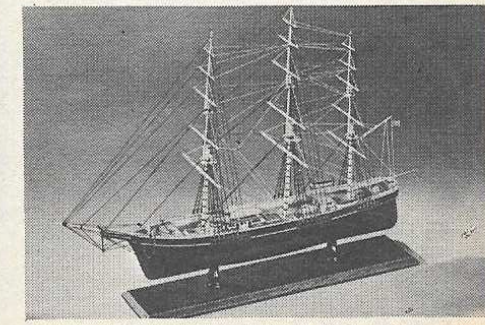
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