

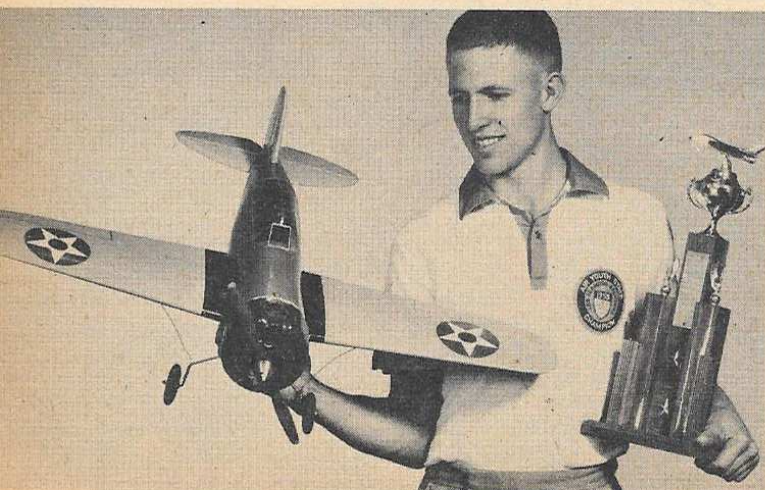
Built originally for Navy, Buffalo or "Peanut Special" also used by Belgium, Netherlands, East Indies. Robert's Control system in model.

Brewster Buffalo

Unless a control-line scale model has been designed by an expert, thoroughly tested and developed, its builders can lose precious time and money in a wrap-up. This 35 to 64 job delivers results.

by **VERN CLEMENTS**

Doug Wenzel, and second-place Nationals Sr. Carrier Event winner. The model not flown before Nats. Doug, Idaho Air Youth Champion.



► The stubby Brewster fighter of WW2 is an interesting scale model that always attracts attention when flown. The scale of 1" equals 1', results in a wingspan of 35".

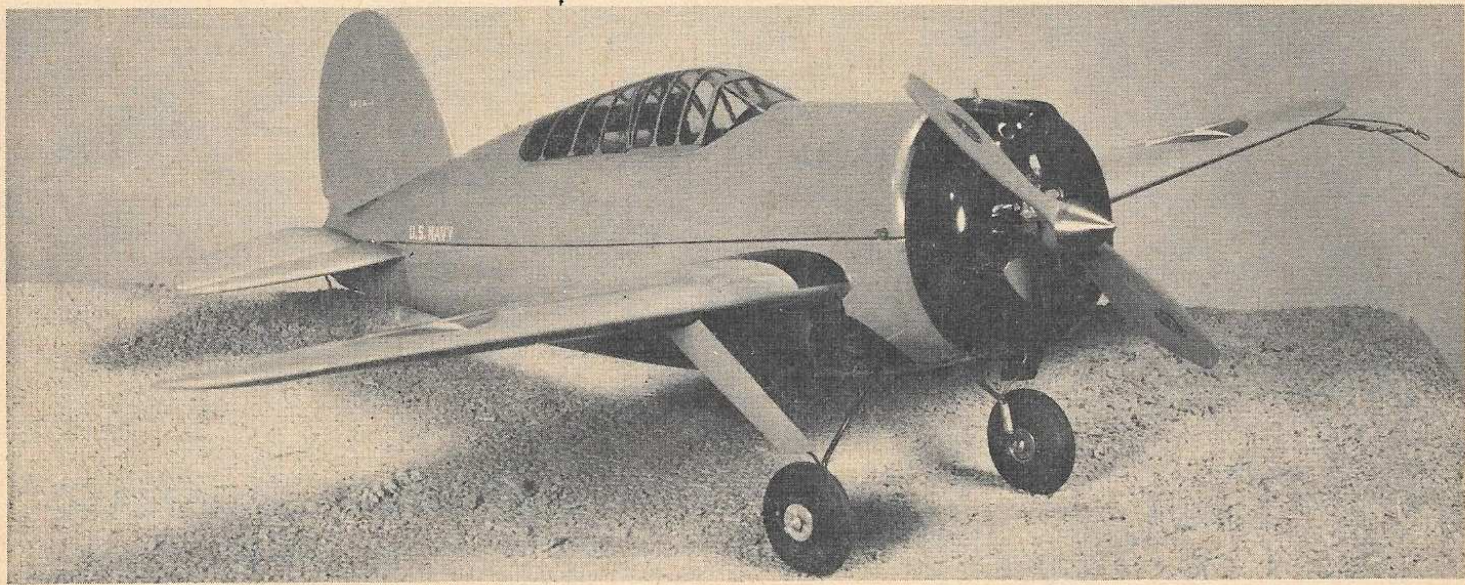
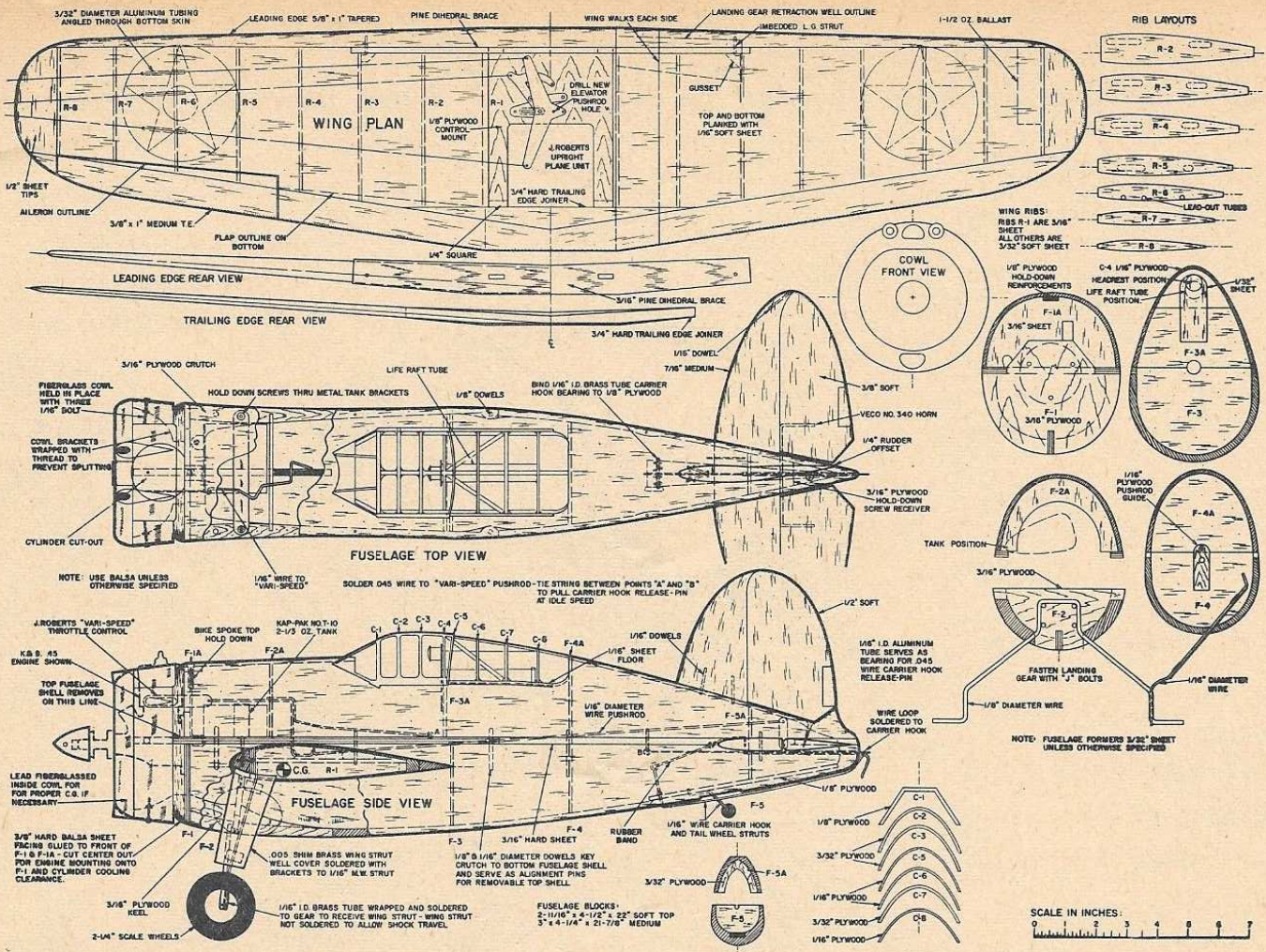
Two K & B .45-powered test models were rushed to completion the night before leaving for the 1959 Nationals. Eventhough they were not ready for competition (the new engines were not broken-in) one was entered officially. It was flown to second-place in the windy Nationals Sr. Carrier Event by Idaho Air Youth Champion, Doug Wenzel.

The model weighs 46 ounces, ready to fly, and can be powered with engines from .35 through .64. A good .35 would give sufficient speed for smooth flights, although several ounces of ballast would be required inside the front edge of the cowl ring to obtain the safe, tested CG position. For carrier events a .60-size engine would be the logical choice. The additional weight of a .60 would eliminate the need for nose ballast (this airplane has a short nose-moment), thus, the overall weight would not be increased enough to effect the low-speed figure.

A glow-plugged Orwick .64 would be a natural for mounting radially to the firewall. The Anderson Spitfire or Enya .60 could be installed, as well as the old Atwood .49's and 51's, although the idling qualities of the latter two engines are not known to this writer. Installation of the McCoy .60 or Dooling .61 could be made if the 3/16" plywood nose crutch and firewall were modified to accommodate beam motor mounts; the fuel tank then can be mounted under the wing center section, this being a practical tank position for engines with rear needle-valve locations.

Performance figures are steadily increasing with more break-in time on the K & B .45 powered test models; thus far, high speeds are slightly over 80 mph, using an 11 x 8 Power propeller. It is important that the K & B .45 receive four or more hours running-in time on the test block *before* being leaned out to maximum power output.

Low-speed flight, and the carrier deck landing-approach, present no problems since control with the J. Roberts



The stubby Brewster, a 1938 design, always attracts attention when flown as a model, reports Clements. Particular ship powered by K & B .45.

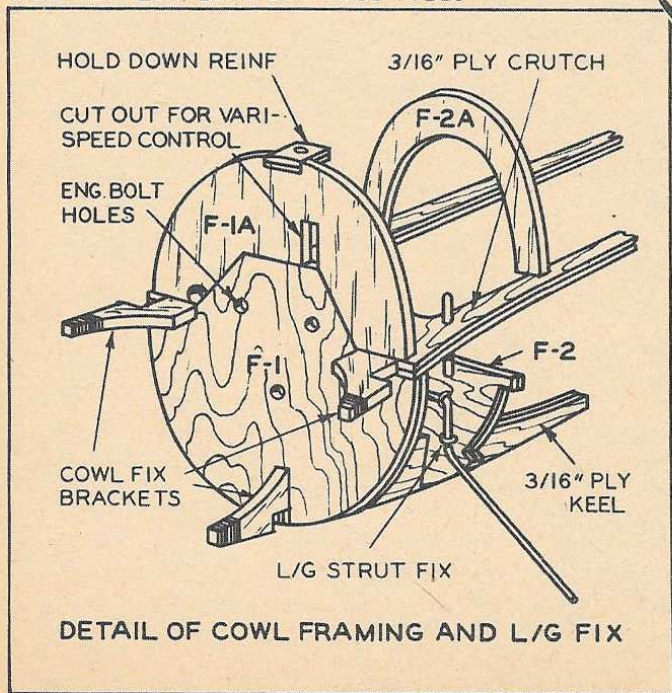
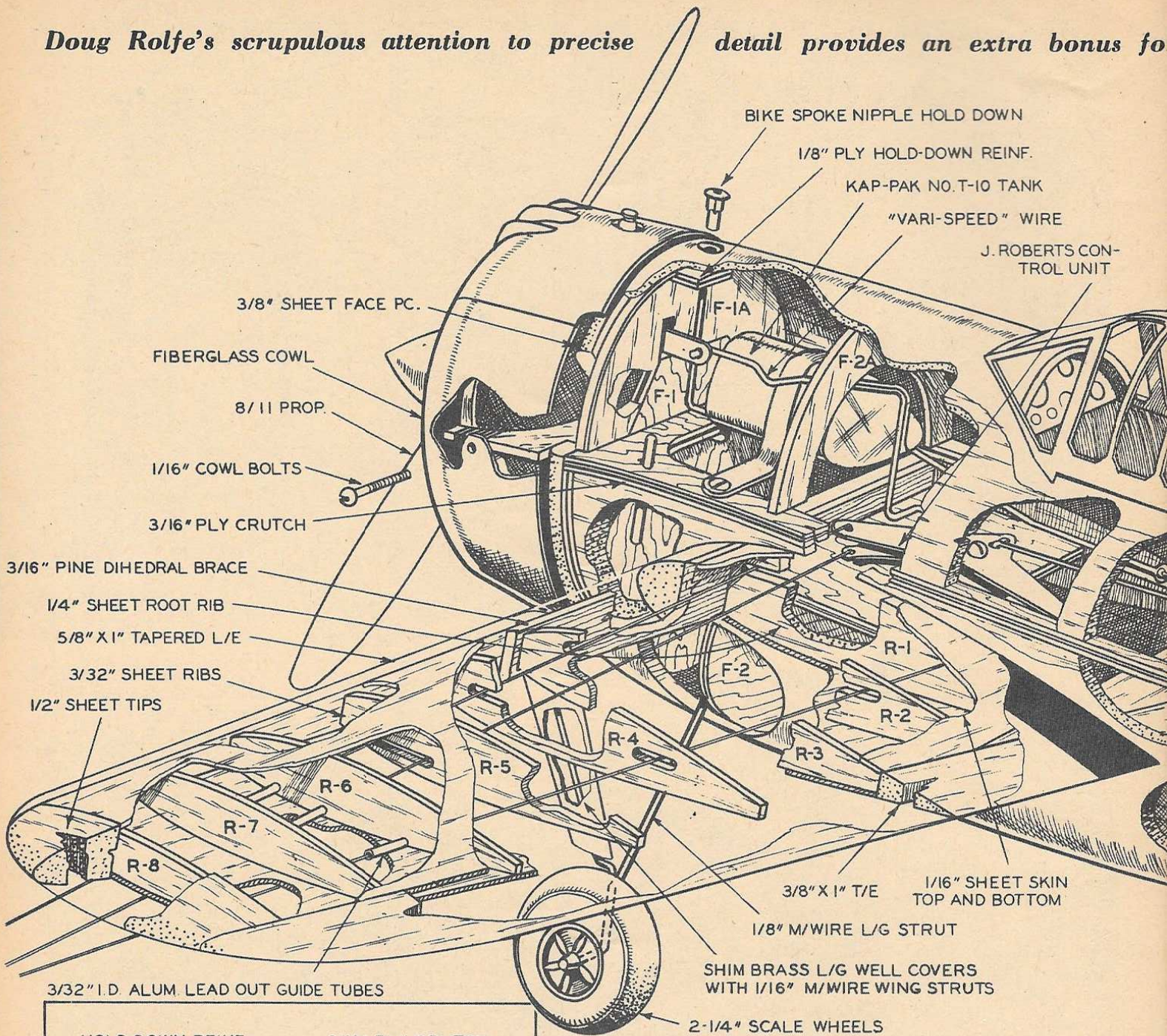
Flight Control system and "Vari-Speed" engine exhaust-slide installation. Flying with one hand, the pilot has complete control over both the elevator and the variable speed (not two-speed) throttle. Control is so easy that the altitude of low-speed flight can actually be regulated by the use of throttle action alone; thus, the lowest possible flying speed of the airplane can be maintained, and yet instant throttle response is available in the necessary proportional degrees to keep the plane airborne in gusty wind conditions. The pilot develops a secure "sense of throttle control feel," similar to the elevator control "feel" we have all acquired. When shooting landings, the Flight Control system permits a model to roll to a stop, even on a hard surface, with the engine continuing to idle very slowly

without dying. The available idle-speed of the engine with Flight Controlled "Vari-Speed" is so slow that only the wing-loading and other design factors of the airplane itself determines the limit of slow-speed flight. The Brewster's low-speed is between 26 and 35 mph., depending on the wind conditions and altitude of the flying site. No doubt, the flying-speed could be further reduced if wing flaps were dropped at low-speed to increase the airfoil's lift, assuming of course, that the flap installation was made without increasing the overall weight and resultant wing-loading of the plane.

Test flights since returning from the Nationals have brought forth numerous tested modifications, incorporated in these plans. The landing-gear (Continued on next page)

Doug Rolfe's scrupulous attention to precise

detail provides an extra bonus fo

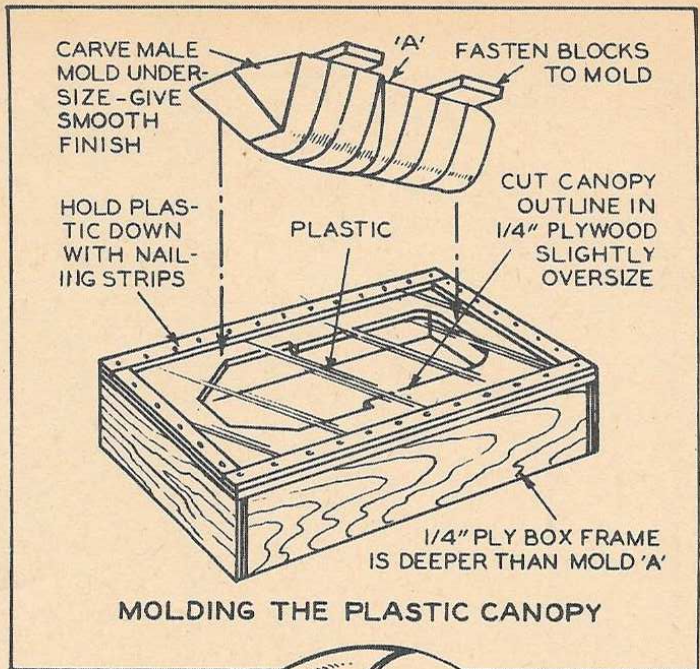
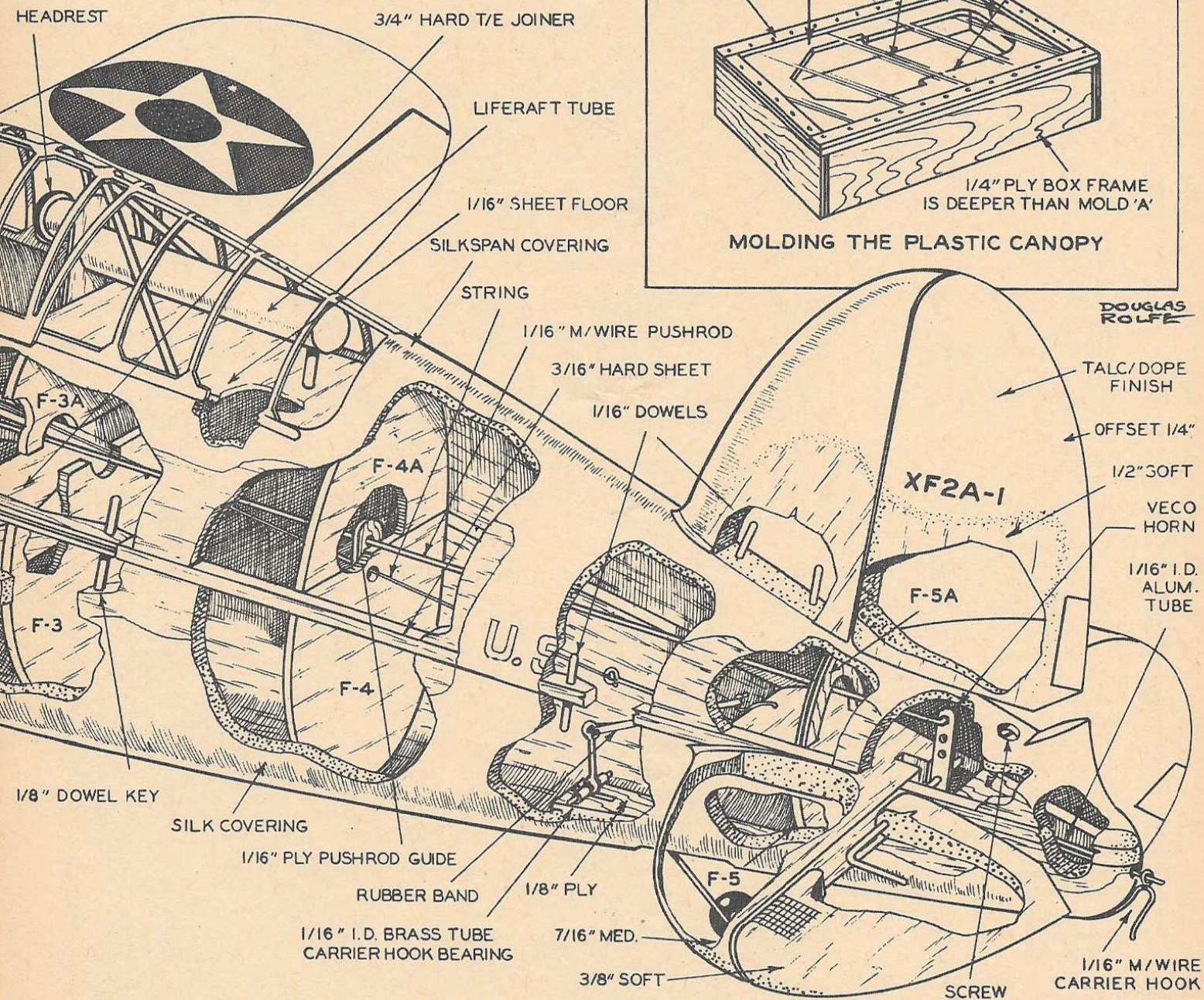


Brewster Buffalo

was moved ahead of the scale position one inch. Originally, we used the scale position and found that the new location was necessary to prevent nose-over landings, even on smooth asphalt surfaces. The relocated landing-gear position is the Brewster model's only deviation from exact scale proportions.

The CG position was also varied on test flights, and was moved back as far as possible in an effort toward improving the bad nose-over on landings condition. The CG shown is as far back as permissible, and allowed more control sensitivity than desired with the elevator pushrod leverage moment provided by the Flight Control plane unit. This was easily compensated for by drilling a new elevator pushrod hole 5/16" closed to the pivot point of the main bellcrank, as shown on the plans. Also, the pushrod is connected to the top hole in the elevator control horn. These control sensitivity reductions have made the model easy to fly.

The carrier hook proved itself positive. It is released



by low-engine-speed action, and is snapped down and held in down position by a rubber band. If the upper portion of the carrier hook should contact the arrestor cord, the hook will not be flipped up, but is held down by the rubber band action until the cord slides down the hook and engages for an arrested-landing. Experts have advised us that the carrier hook should be made of 3/32" wire, but the 1/16" wire hook has yet to fail us.

CONSTRUCTION

The construction is engineered for strength. Parts are keyed and doweled together to give a model that will really stand up to hard carrier-deck landing abuse without breaking apart at the seams.
Fuselage: Trace the top and side outline views of the fuselage onto lightweight balsa blocks. Remember to trace

the wing and stabilizer airfoil cut-outs, as well as the notches for the landing-gear former (F-2) on the bottom block side-view. The 1/8" and 1/16" dowel key holes must also be marked on the blocks, and drilled before sawing the blocks to shape, to insure proper alignment for the dowel pins that serve to key the upper and lower fuselage shells together. Cut the fuselage blocks to shape with a jigsaw, including the airfoil cut-outs to receive the wing and stabilizer, and the notches for Former F-2. Saw out the 3/16" width strip in the lower block, to be replaced later by the 3/16" plywood lower nose keel. The 3/16" plywood crutch that fits on top of the lower fuselage block (shown shaded on the top view of the fuselage plan) is held temporarily in place with dowels through the key holes. The 3/16" hard balsa strips (to fill the remaining length of space between the top (Continued on page 36)



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(Continued from page 15)

and bottom fuselage blocks) are also traced from the top view and glued permanently in place on top of the rear portion of the bottom fuselage block. The top fuselage block is now keyed in place (not glued) with dowels in the alignment pin holes. Using a knife with a long whittler's blade, rough carve the outside of the fuselage to shape. Smooth down with a large sandpaper block, checking the cross-sections with cardboard templates as you work.

After the fuselage exterior has been accurately shaped, remove the top fuselage block and the plywood crutch, then hollow out the inside of the fuselage blocks to the thickness indicated on the plans. A wide, curved wood gouge is used for hollowing out the fuselage, followed by interior sanding with a piece of course sandpaper. The fuselage formers should be used as interior templates for checking the wall thickness of the top and bottom fuselage shells.

Pre-glue all joining areas of the crutch and bulkheads before gluing them in place permanently. Shape the 1/8" steel wire landing gear and cut notches in the bottom of the fuselage for it to pass through from the bottom. After checking the fit of the landing gear and Former F-2 in the fuselage, you can then glue Former F-2 in place and bolt the gear to it with J-bolts.

Former F-1 and the lower 3/16" plywood keel can now be glued in place. Glue the alignment dowels permanently into the holes you have drilled into the bottom shell walls (except for the dowels that pass through the stabilizer and into the wing). Glue Formers F-3 and F-4 in place.

Shape the carrier hook from 1/16" steel wire. Remember to slip the 1/16" I.D. brass tube onto the wire, to serve as a bearing, before bending the leverage portion of the wire up for the rubber band attachment point. Bind the carrier hook brass bearing tube and the tail-wheel struts onto the 1/2" plywood plate with copper wire through holes in the plywood. Solder the wire wrapping to the bearing tube, then apply several coats of glue. Cut slots through the bottom of the fuselage for the carrier hook and tail wheel to pass through and glue their 1/2" plywood mount into place. Former F-5 can now be installed, as well as the aluminum tube bearing for the carrier hook release-pin. Glue the 3/16" plywood piece into the tail of the bottom shell, to serve as a receiver of the rear hold-down screw for the removable fuselage top shell.

Glue all formers inside the top fuselage shell, and the 1/16" balsa sheet (run grain across) canopy floor between Formers F-3A and F-4A, per the plans. The front of the removable fuselage top shell is held down with a bicycle spoke. The bike spoke is bent to hook onto the 3/16" plywood bottom shell crutch, and well glued in place. A small piece of 1/2" plywood is glued inside the top shell (through notch provided in

top of Former F-1A) for the bike spoke nipple to pass through. The front of Formers F-1 and F-1A are faced with hard 1/2" sheet balsa; remember to cut the center out of these pieces before gluing them into place, to allow clearance for the engine to be mounted against Former F-1. The outside edge is later rounded off according to the plans, to allow cooling air to escape around the complete circumference of the cowl.

Wings: Trace the wing leading-edges and trailing-edges top and rear views onto medium balsa wood. The leading-edge and trailing-edge center-lines should also be indicated so that the wing rib center-line can be matched during assembly. Likewise, the center-lines should be drawn on the dihedral joiner braces. Before assembling the wing, the leading and trailing edges should be carved and sanded to approximate shape; they are block sanded to blend into the final airfoil shape after the wing panels are covered with the 1/16" sheet balsa skin. The 1/2" hard balsa trailing-edge dihedral joiner is cut to top and rear-view shape before assembling the wing. Drill 1/16" landing gear strut holes in the 3/16" spruce or pine leading-edge dihedral brace. Also, drill and cut out the two slots for the 1/2" plywood control mount to notch into. The two Flight Control mount holes should be accurately drilled at the indicated locations in the 1/2" plywood control mount. A slot is also cut out in the mount per the plans, to allow freedom of action for the main bellcrank pivot-pin.

The entire wing can be assembled as one unit if constructed over the plans on a two-piece assembly board. The assembly-board is hinged at the center, with the ends raised up to correspond with the dihedral angle of the wings; thus, the correct dihedral angle is automatically built into the wing when it is assembled. Allow sufficient time for the glue to dry, then remove the structure from the dihedral assembly board and cover the lower surface of the wing panels with soft 1/16" sheet balsa.

Attach heavy stranded lead-out cables to the J. Roberts plane unit, and bolt the plane unit to the control mount. The cables go through the indicated slots in the ribs, and exit through the bottom 1/16" wing sheeting due to the dihedral-angle. File notches in the 3/32" aluminum tube lead-out bearings so that the glue will hold them firmly in place. Apply several coats of glue, and a strip of silk over the tubes (inside of the wing). After the glue is dry, pull the lead-out cables out of the tubes and file them off flush with the bottom surface of the wing. The ends of the main bellcrank are bent down slightly, to allow the elevator lead-out cables to go under the 1/16" top sheeting (to be applied later) at Rib R-1. Relieve Rib R-1 to allow full bellcrank action, and check the lead-

(Continued on page 40)



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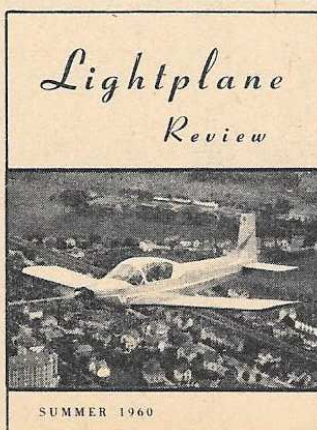
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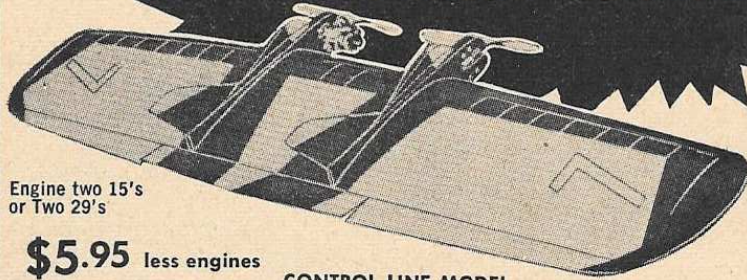
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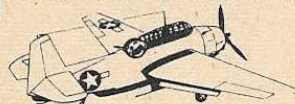
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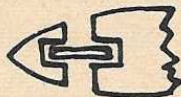


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out slots in the other ribs for any friction on the lead-out cables. You can now slip the wing into place through the lower fuselage shell; check alignment carefully and glue well.

It is important that no less than 1½ oz. of ballast be glued in the outboard wing tip. Glue a piece of gauze over the ballast to hold it securely in place. The wing tip ballast will hold the flying wires tight during low-speed flight when rudder and engine offsets would have little effect.

Landing Gear: Shape the landing-gear wing struts from 1/16" steel wire. The lower ends of the struts are a free fit (not soldered) in the 1/16" I.D. brass tubes that are wrapped with copper wire and soldered to the 1/8" wire main landing-gear struts. This free fit attachment method allows landing shock travel; otherwise, without this shock travel feature, the wing struts will bend out of shape since the landing-gear hits the deck with a hard down-force when the carrier hook catches the arrestor cord. The upper ends of the landing-gear wing struts are pressed through the holes provided in the wing's leading-edge dihedral brace. Glue well, and add hard scrap balsa gussets at these upper strut attachment points.

The top of the wing can now be covered with soft 1/16" sheet balsa, which is butted up against the fuselage over Ribs R-I. It should be noted too, that the sheeting butts up against the leading and trailing-edges, and that it does not cover the wing center-section which is left open inside the fuselage for control hook-up accessibility. After the glue is thoroughly dry, the leading and trailing-edges can be block-sanded to blend into the final airfoil shape.

Stabilizer: When tracing the stabilizer, mark the two 1/16" dowel hole positions. The stabilizer installation is strengthened by the hardwood dowels that extend through it, into the bottom fuselage shell. These dowels extend above the stabilizer per the plans, serving as alignment pins for the removable top fuselage shell. Drill holes and glue the 1/16" reinforcement dowels in the stabilizer tips before sawing the stabilizer out and sanding it to shape. All tail surfaces are sanded to 3/16" thickness at their tips. After shaping the elevators, drill holes and imbed the Veco No. 340 control horn, which also serves as a joiner for the two elevator halves. Hinge the elevators to the stabilizer with strips of untreated full-scale aircraft pinking tape, in normal hinging practice. Hinges are not installed at the tips of the stabilizer, where the hinge line curves. Glue and dowel the completed horizontal tail assembly to the lower fuselage shell.

Engine and tank: Drill a couple of 1/8" oil-drain holes in the bottom of the fuselage nose section. After applying several coats of butyrate dope to the firewall and inside the lower fuselage shell, the motor can be installed. A radial adapter mount ring is used on the K & B .45. No engine thrust offset is recommended; line-pull at high-speed flight is sufficient with the force set-up shown on the plans.

The Kap-Pac No. T-10 (2½ oz.) tank is of convenient size, allowing throttle push-rod clearance space. Solder strong metal mounting brackets across the top and bottom of the tank, and another on the front according to the plans. The removable tank is held in place with three wood screws that go through the brackets and into the 3/16" plywood crutch. The wedged side of the fuel tank is lowered (angle is shown on Bulkhead F-2A on the plans) to improve pick-up of a low fuel supply when flying at slow speed and taxiing on the ground.

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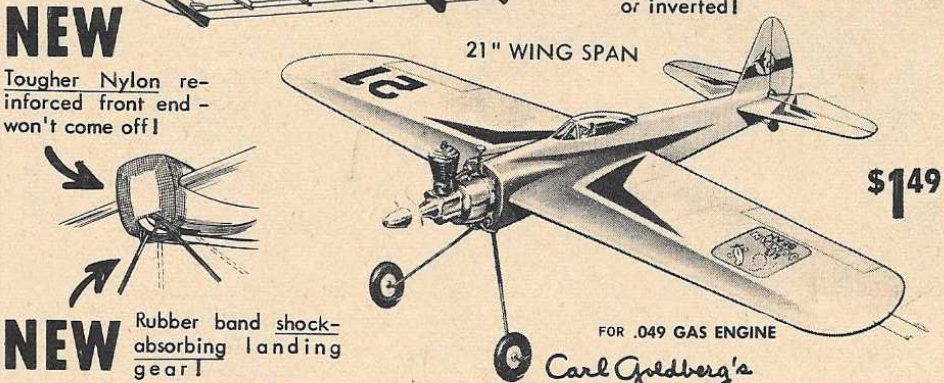
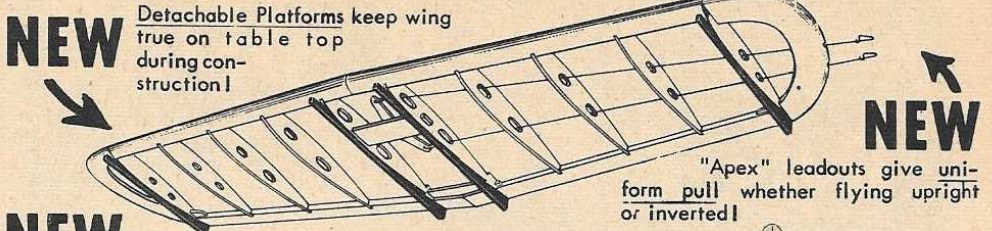
Installations: Install the 1/16" steel wire elevator pushrod. As already mentioned, the control action is geared down by drilling a new pushrod hole 5/16" closer to the main bellerank pivot point, and, the top control horn hole is used. It is important that the 1/16" plywood pushrod guide be used at Former F-4 location. Shape the "Vari-Speed" pushrod from 1/16" steel wire as shown on the plans. The portion of the pushrod that is bent up to go over the top of the tank is angled toward the exhaust stack side of the plane, to give a straighter push-pull action to the throttle slide. An adjustment "V" is bent in the pushrod, above the tank, to allow easy engine idle-speed adjustment at the flying field. Check the pushrod action for free movement, making sure that the possibility of jamming is eliminated when the controls are actuated. When you are satisfied with the throttle pushrod shape, bind and solder the .045 wire to it that pulls the carrier hook release-pin string. This wire also serves to stiffen the upper bend angle of the throttle pushrod, and eliminates possible pushrod flexing that could result in a "spongy" throttle action. Throttle action should also be checked with the fuselage top shell installed, making sure that the pushrod slide connection does not rub and bind through Former F-1A. The pushrods are held with 1/16" I.D. washers, and soldered. Neutralize the soldering acid with soda water solution, then oil all moving connections, including the "Vari-Speed," for free and easy throttle-action.

Slip the .045 steel wire carrier hook release pin into its bearing, and tie a string to it, between points "A" and "B" per the plans. The length of the string determines the release moment of the carrier hook when low throttle speed control is transmitted to the engine. A 1/32" wire hook is glued on the stabilizer, inside the fuselage; a rubber band is stretched between it and the carrier hook leverage arm to pull the carrier hook down and hold it in down position. The carrier hook can easily be re-loaded in "up" position without removing the top fuselage shell by pulling the elevator wing lead-out cables for full power, and pointing the tail of the plane down, while holding the carrier hook in "up" position with your hand.

Glue the fin and rudder to the top fuselage shell. The rudder is offset 1/4" to the right, just enough to give access to the rear fuselage shell hold-down screw with a long screwdriver. Drill holes and glue the two 1/16" dowels through the upper fuselage shell and into the fin for reinforcement.

The 1/32" sheet balsa or cardboard headrest support is glued to Former F-3A. The headrest and life raft tube are carved from soft balsa, or can be made from plastic tubes. The life raft tube is supported at the back with a 1/8" dowel, and the front is glued to the headrest support. The turn-over structure is made from 3/8" dowels. Saw the canopy formers (C-1 through C-8) from the indicated thickness of plywood, using a magnetic hobby type jig-saw. Glue the canopy formers in place, and the 1/16" x 1/8" balsa strips that fit between the tops of each former. The two windshield braces are 1/16" square hard balsa or pine. The rounded corners in the canopy structure can be duplicated by gluing in 1/16" sheet scraps, and sanding them with a round sanding stick after the glue is dry. Fill in the canopy structure joints with sanding sealer, and sand level to hide the joints. The inside of the cockpit and canopy structure is painted dull-black (mix talcum powder with black dope for dull effect). The outside of the canopy structure is doped the same color

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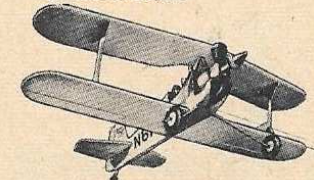
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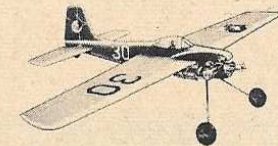
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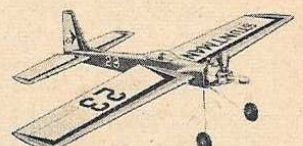
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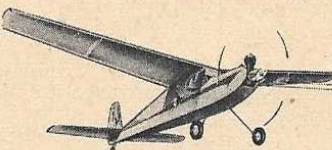
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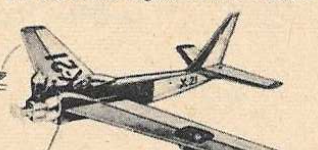
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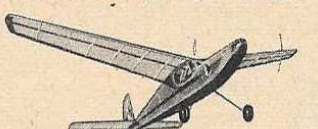
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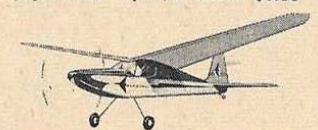
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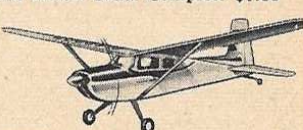
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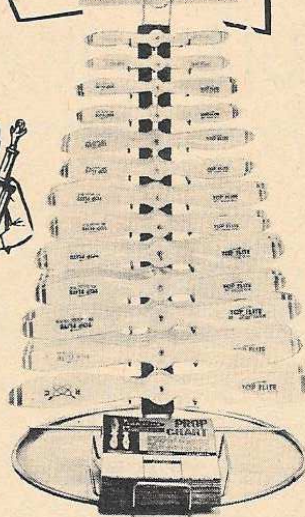
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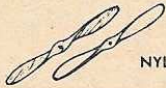


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as the fuselage. If desired, a paper instrument panel, glued to 1/16" sheet balsa backing, can be glued in place for added effect.

Molded canopy: Plastic coverage of the canopy can be applied in strips between each former, although we molded one-piece canopies in the following manner: The canopy top and side views were traced onto a hard balsa block and cut out with a band-saw. While carving and sanding this canopy male forming block to shape, the cross sections were checked against templates from the canopy former patterns. The plywood scraps left from the outsides of the canopy formers (C-1 through C-8) can be used as templates. Several hands (with gloves on) can stretch a sheet of heated plastic over this male forming block. We made a 1/4" plywood box-lid, with the top-view of the canopy cut out slightly over size in it. An over-size sheet of plastic was held to the top of this box with scrap nailing strips, and the whole unit placed in the oven and heated until the plastic was soft enough to mold. The male canopy mold is then pressed into the plastic, through the canopy top-view cut-out in the box. Fasten over-size scrap blocks across the bottom of the male canopy mold to serve as stops when the mold is pressed into the box. If necessary, grease the male mold so the plastic will stretch over it more easily. Finish the canopy by polishing it with jewelers rouge or toothpaste.

Cowling: The engine cowling is made from fiberglass. This material proved to be very practical, as it is hot-fuel proof, fire-proof, and flexible enough to allow easy removal if necessary. Mark the side, top, and front view (including the front cowl opening) onto a balsa block and saw to shape. Carve and sand this male form block to exterior shape. It should be approximately 1/16" undersize to allow for the fiberglass thickness build-up. Glue on scraps and shape them for the air intakes and machine gun fairings. Apply several coats of clear dope to the male form to seal the wood, then coat with fiberglass release agent or wax. We used heavy full-size boat fiberglass cloth, cut into 1/4" x 3 1/2" strips; with resin, apply these strips on the male mold in a chord-wise direction (from the front edge to the trailing-edge of the cowl). Overlap the fiberglass cloth strips approximately 1/8". After the resin has cured enough, the high spots can be roughly sanded down and the edges trimmed with an X-Acto razor-saw blade. Apply a second layer of fiberglass cloth strips and work down in the same manner. Mix color pigment into the resin for the final five or six finish coats. After the fiberglass cowl is sanded smooth with fine wet sandpaper, remove it from the male mold. Drill out the openings for the intakes, machine guns, and engine cylinder head. Polish with rubbing compound to a mirror-like finish. Wrap the three plywood cowl hold-on brackets with thread to prevent splitting, and apply several coats of dope. Allow sufficient drying time before drilling the 1/16" holes for the cowl hold-on bolts to pass through.

Finish: Apply a couple of coats of clear dope to the plane to prepare it for covering and finishing. The fuselage bottom shell should be covered with silk. To further strengthen the firewall, the silk is doped around the front of the nose. Cover the wings and top fuselage shell with Silk-span. The tail does not require covering. Give the model several coats of sanding sealer, consisting of a mixture of talcum powder, clear dope, and thinner. Let the sanding sealer dry several days if possible before sanding it down to a smooth finish, in preparation for the color coats.

I used the color scheme from the Brewster painting on the cover of the October, 1938 issue of MAN. It appeared to have yellow wings and tail, with a red cowl, and a medium blue fuselage (my interpretation of the fuselage color may be wrong). Doug Wenzel's model used the same color scheme, except for a silver fuselage. The wing-walks, landing-gear retraction wells, and control surface out-lines are doped dull-black.

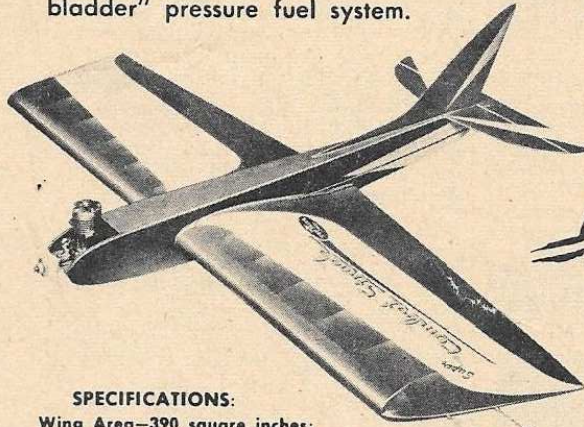
Check the center of gravity position before flying; if tail-heavy add soft lead fishing sinkers inside the front edge of the cowl ring until the model balances 1 1/2" behind the wing leading-edge at root Rib R-1 position. The lead sinkers can be held in place with a piece of fiberglass cloth saturated with resin. Never attempt flying a tail-heavy model; this rule applies to all types.

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