MODEL AIRPLANE NEWS • CONSTRUCTION PULL-OUT •

THE Gnat

WHEN I originally decided to build a small sport/pattern-type aircraft, it was for several reasons. At the time, fuel was virtually unavailable in our area; I didn't have much balsa wood on hand; and I was fed up with having to disassemble my larger airplanes just to transport them in my Volkswagon beetle. I wanted a plane that would be quick and easy to build, wouldn't require an abundance of material, wouldn't cost much to operate and would be a real joy to fly. The Gnat certainly fills the bill.

SMALL SPORT/PATTERN DESIGN THAT'S BIG ON PERFORMANCE!

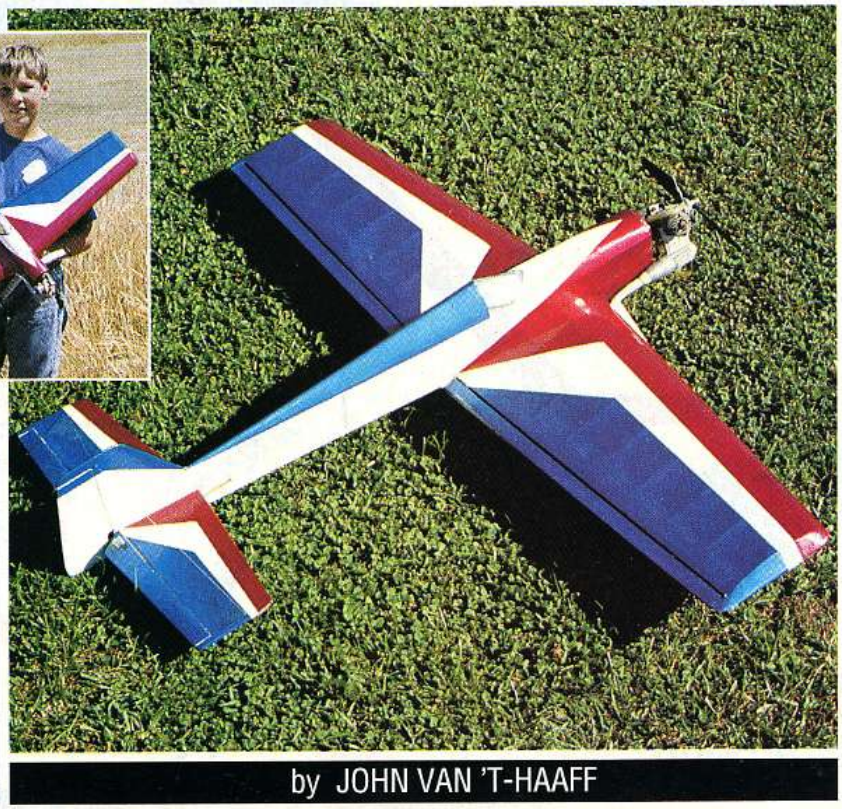
SPECIFICATIONS

Type: Sport pattern
Wingspan: 36 inches
Length: 31½ inches
Weight: 24 to 26 ounces
Wing area: 234 square inches
Wing loading: 14.8 ounces per square foot
Power req'd: O.S. Max .10
No. of channels req'd: 4 (throttle, aileron, elevator and rudder)

The author's son, John, shows off the new Gnat. There's no cowling, so adjusting the engine is a snap.

Features: the Gnat uses conventional balsa and plywood construction methods, and it isn't hard to build. The fully symmetrical wing has building tabs so it can be built flat on the workbench. An O.S. Max .10 with a 7x4 Master Airscrew was used in the prototype—an excellent choice for the Gnat. A 7x4.5 Top Flight prop was also used with good results. I've tried a .15 engine, but it's too heavy and has too much power for the model. (Not recommended!)

Comments: the Gnat is inexpensive to build and operate and easy to transport to the flying field. It has a predictable stall (straight ahead) and, with the control deflections shown on the plans, it's a joy to fly. A micro-size radio is required.



by JOHN VAN 'T-HAAFF

CONSTRUCTION

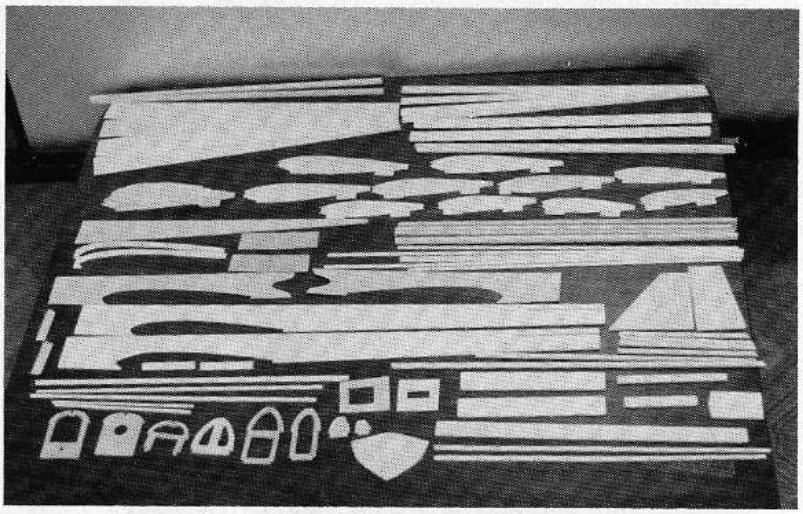
The Gnat's construction is fairly straightforward, and all incidences are set at 0 degrees. First, lay out the wood and cut out all the pieces. To check that the ribs are symmetrical, reverse the rib pattern over each rib after laying it out on the 1/16-inch sheet. Since the wing section is fully symmetrical, this task is quite easy. It also helps if you draw the center line on both the pattern and the rib stock. The inside of both R-2 ribs should be laminated with 1/64-inch ply.

TAIL GROUP

Cut the fin and rudder out of sheet stock according to the plan. I reinforced both sides of the rudder and the elevator with 1/64-inch ply (feathered at the edges) where the horn would be mounted. I also added ply to the opposite side to reinforce the joint between the elevator halves and the joiner. Control surfaces are tapered as a matter of course. On an aircraft of this size, it may not be aerodynamically significant, but it's more aesthetically pleasing.

WING

If you don't have a jig, use the building tabs, and build the wing directly on top of the plan on your building board. This should automatically give you 1 1/2 degrees of washout. To help set the angle of dihedral when the two wing panels are joined, set R-1 at 1 1/2 degrees. (The gauge provided on the plan will help.) Once you've aligned the ribs over the plan, insert the upper and lower 1/4-inch-square spruce spars. Check the alignment of the leading edge to the ribs, adjust as required and glue into place.



To save time, cut out all the parts before you start to build.

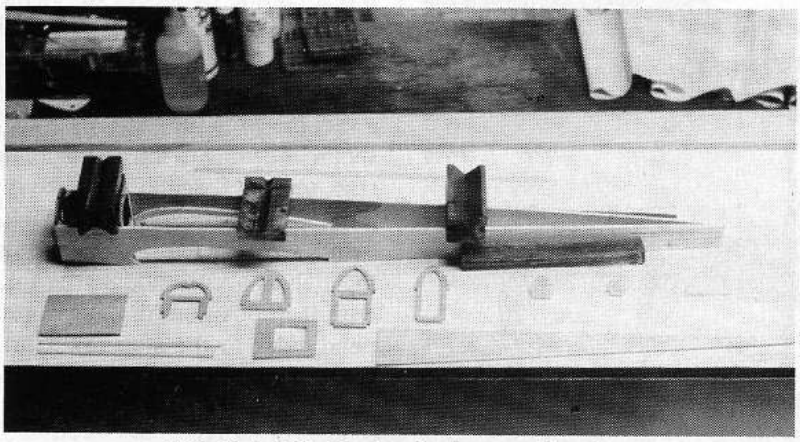
To ensure a proper fit for the 3/16x1/4-inch trailing-edge stock, sand the trailing edges of the ribs and glue them into place. Add the fore and aft sheeting to the top of the wing, and add the cap strips. (To help prevent the wing from warping or twisting, it's a good idea to complete the top half of each wing section before removing the wing panel from the board.) Remove the wing from the board, and apply trailing-edge sheeting.

After the dihedral braces and the locating dowel have been glued in, carefully cut off the tabs forward of the spar, sand the ribs gently, and affix the sheeting as you did for the top side. Remove the rear tabs and sand as required. Complete both panels in the same manner, and join them to produce the dihedral indicated on the plan. Sheet the wing center section between both R-2s with 1/16-inch balsa on both the top and the bottom.

To accommodate the servo before you sheet the top, install the servo tray near the wing top surface where indicated, and trim out the two center ribs. When you install the dihedral braces, mark the spar where the rib meets it both fore and aft. Carefully cut from the bottom of the rib to the top in a straight line (you'll cut through R-1 and R-2). Don't puncture the top sheeting. Slip the 1/64-inch ply brace into position. Realign the ribs with the marks and glue them into place. Repeat this procedure for the other side.

With a piece of sharp tube, carefully cut a hole in the wing leading edge where both panels join. Insert the 3/16-inch dowel, and be careful to align it with the center line marked on the sides of R-1. Install lite-ply or hard balsa bracing, and complete the sheeting as you did for the top side.

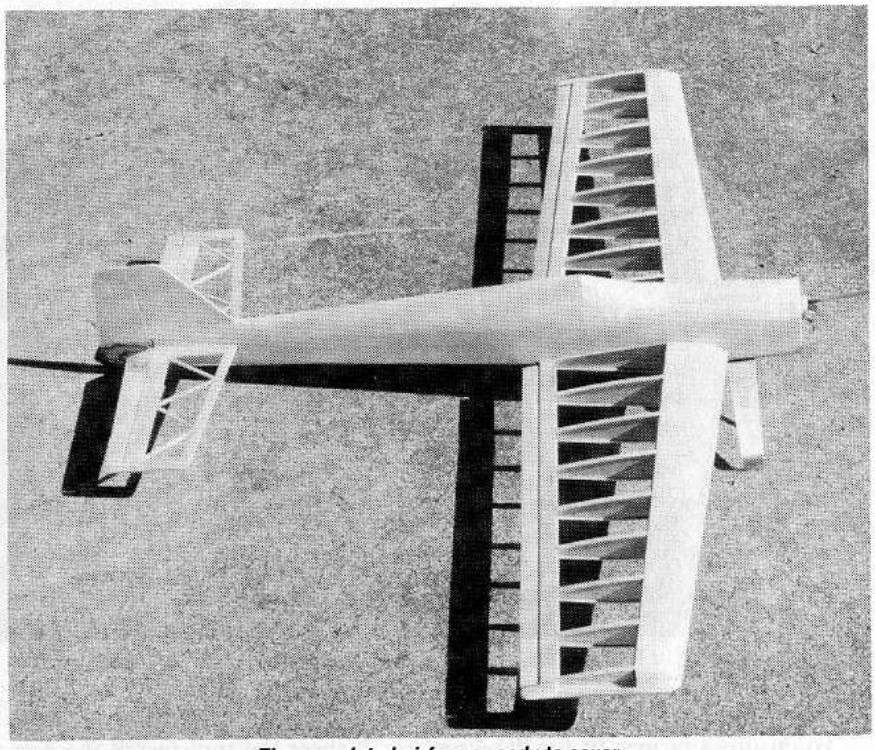
When you final-sand the wing leading edge, leave the center fairly sharp, and begin rounding between F-5 and F-6 so that the tip will be noticeably round. (This helps to maximize stability at low speeds.) The ailerons should be beveled on the leading edge. I use Goldberg's* no. 401 1/16-inch strip aileron horns for aileron control, and I hinged each aileron with two Sonic-Tronics* "easy" hinges. I attached the wing to the fuselage with a 10x32 nylon wing bolt .



Weights hold the fuselage in place over the plan.

FUSELAGE

The fuselage is also built over the plan. Before assembly, glue the 1/64-inch-thick ply doubler to each side, and install the 1/8-inch wing-saddle doubler over the top

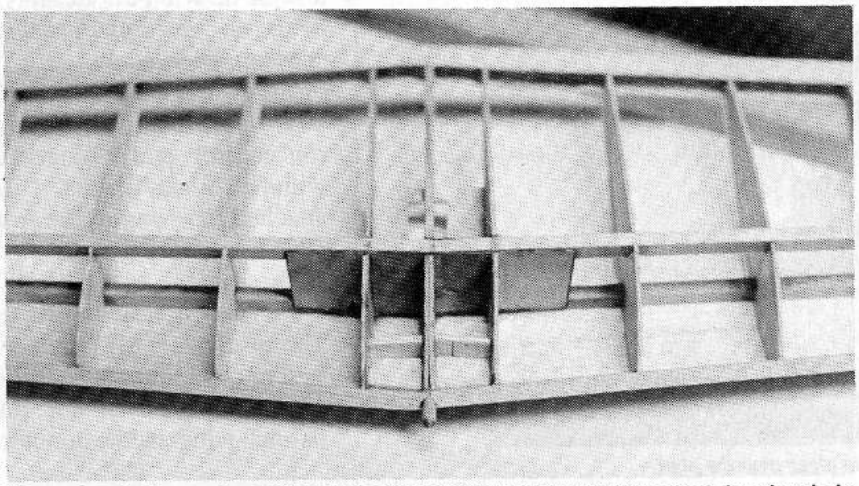


The completed airframe ready to cover.

I've had excellent results flying the Gnat with an O.S. Max .10 engine, a 7x4 Master Airscrew fiberglass prop or a Top Flight 7x4.5 wooden prop.

of the ply. Mark the former locations before you begin assembly. At this point, I like to add the triangular 3/8-inch balsa reinforcement pieces and the 1/8-inch-square bottom stringer. (Remember to build a left side *and* a right side.)

Begin by gluing F-1 and F-2 to one of the fuselage sides, and make sure that they're perpendicular. Now position the sides over the plan, using weights to hold everything in place. When the glue has dried, chamfer the tail ends of the sides so that they join as shown on the plan. Holding the assembly in place, add the remaining formers, check for alignment, and glue them into place. When the glue has set, remove the fuselage from the plan and invert it. Add the skid-attachment plate to the rear.



Shown here is the center section of the joined wing halves. The alignment dowel and ply braces are installed before the top sheeting.

Before applying the bottom sheeting, add the 1/16-inch-thick ply fuselage bottom from F-5 to the rear of the plane, and install the fuselage bottom gear-mounting plate between the firewall and F-2. The turtle-deck triangle stock and sheeting and the forward sheeting and windshield are added only after the tail group has been secured (after the wing has been fitted to the saddle).

Note that F-7 and F-8 aren't full-length formers. They extend only from the stiffener to where the triangular top stringer is attached to them. After the tail has been secured in place, the 1/4-inch triangular stringer can be joined to the top of the formers and faired into the fin leading edge. To determine whether shims are required, check the height of the formers with a straightedge, and sand them with a straight block if they're too high.

MATING THE WING

Carefully fit the wing on the fuselage, and adjust the saddle as required. Prior to covering, fill any voids with balsa strips or filler. When the wing is square with the fuselage's center line, pilot-drill through the mounting tab and into the bottom of the fuse; then disassemble the fuse. Install a 1/8-inch-thick ply doubler behind F-5, inside the 1/16-inch-thick ply bottom, and drill and tap for the mounting bolt.

Drill the wing tab to accommodate the mounting bolt, and re-join the wing to the fuse. Before completing the sheeting, insert a couple of pieces of 3/8-inch triangular scrap between the top of the wing leading edge and F-2, and glue them to the rear of F-2.

Set the wing incidence at 0 degrees and secure the wing to the fuselage. Install the stab, set it at 0 degrees, square it with the wing, and glue it into position. Carefully trim away enough of the fuselage above the stab to accommodate the fin, and secure it in position, making sure it's perpendicular to the stab. The turtle deck, forward sheeting and windshield can now be installed.

LIGHT WHEELS

I made the wheels out of 1/32-inch-thick plywood, and I mounted O-ring tires on them. The wheels and the landing-gear combination are very light and create little drag. I don't recommend using wooden wheels on hard-top surfaces or dirt runways, but they're fine on grass. I've had three full seasons of flying with this aircraft, and I haven't had to replace the gear or the wheels. The plastic hub in the center is just now showing signs of wear. If you don't fancy making your own, Williams Bros.* wheels are good substitutes.

COVERING

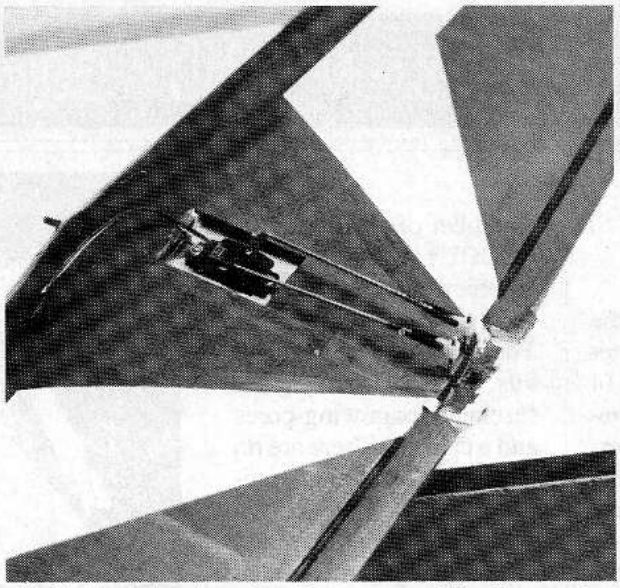
I covered the Gnat with white MonoKote* and Black Baron* red and blue metal-flake. It looks fine, but it's tricky to use iron-on materials that require different temperatures to apply them. Try to stick with one type of covering; your favorite will do. To improve performance, I recommend that you cover the control-surface gaps.

FLYING

Balance the aircraft carefully. The control deflections shown are recommended only for advanced pilots. The aircraft is very responsive to aileron control. Make sure that the elevator doesn't bind in the rudder and that the throttle servo arm clears the top of the wing.

I've had excellent results flying the Gnat with an O.S.* Max .10 engine, a 7x4 Master Airscrew* fiberglass prop or a Top Flight* 7x4.5 wooden prop. The plane has quite a large flight envelope. If you're a pilot with intermediate skills, then you'll have a ball flying with the control deflection indicated on the plan. The plane has no nasty habits; stalls are straight ahead; and it tracks beautifully through all maneuvers. It flies as well inverted as it does right side up. I've also flown this airplane with an O.S. Max .15 and, although I had no trouble flying it, the larger engine increased power and weight too much, and landings were considerably hotter.

The plane's cramped quarters make micro-gear mandatory. Unless you have little or no patience, or you're all thumbs, this shouldn't present too much of a problem. Enjoy!



The finished wing shows the aileron servo and the aileron control linkage.

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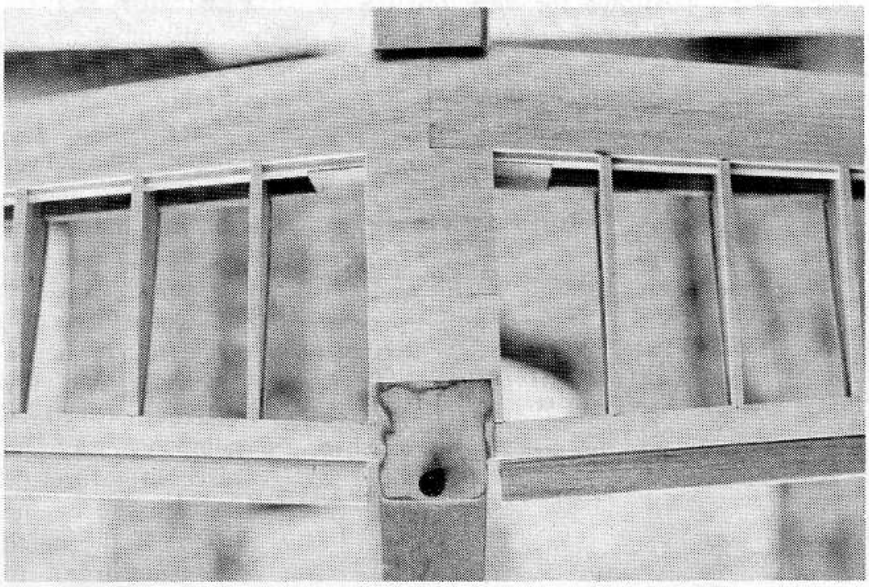

The underside of the wing with the plywood plate and the wing-mounting bolt.

Here are the addresses of the companies mentioned in this article:

***Carl Goldberg Models,** 2828 Cochran St., Simi Valley, CA 93065.*

***Sonic-Tronics,** 7865 Mill Rd., Elkins Park, PA 19117.*

***Williams Bros.,** 181 Pawnee St., San Marcos, CA 92069.*

***MonoKote;** distributed by Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616.*

***Black Baron;** distributed by Coverite, 420 Babylon Rd., Horsham, PA 19044.*

***O.S./Great Planes Model Distributors,** P.O. Box 4021, Champaign, IL 61824.*

***Master Airscrew;** distributed by Windsor Propeller Co., 384 Tesconi Ct., Santa Rosa, CA 95401.*

***Top Flight Models,** 2635 S. Wabash Ave., Chicago, IL 60616.* ■