Building the R/C Guff

If you've been following our series on the history of Walt Good's landmark R/C model, then you are primed and ready for the complete construction article presented here. Full-size plans are available, see page 106.

• *As I promised in the August '88 issue when introducing this series on Walt and Bill Good's history-making model, the R/C Guff, we are concluding with this presentation of the construction article for the plane itself. The plans have been drawn by Phil Bernhardt directly from the original presentation in the November 1940 issue of a three-part series in* Air Trails *magazine. Although some sketches and details of items, such as battery boxes, radio installation, ignition wiring, etc., have been deleted, the structural design has been totally unaltered. In fact, numerous telephone calls were made to Walt as the drawings progressed, making sure that all structure was correct and that no mistakes in the original presentation were being carried through to this new set of drawings.*

Note that several photos revealed that Walt, the builder, had laboriously cut lightening holes in the wing ribs, though this is not indicated on the drawings. Why? Because Walt saved all of the cutout disks and found that the whole batch only weighed half an ounce, hardly worth all the effort to reduce weight!

Speaking of ribs, the original wing was built with three-piece ribs, as the spars were full depth. Unless you're a real masochist, there no need to go through this exercise, as Phil has shown an alternate wing construction following the modern I-beam method, using top and bottom "cap" spars with vertical-grain webbing.

Most modelers only read the instructions as a last resort, when all else fails; but we felt that, for old time's sake, we would reproduce the majority of the original introduction and building instructions. Except for modern adhesives and hardware, it's really not all that different. If you notice any discrepancies in wood sizes, etc., stick with the plans. And remember, the original aircraft weighed only a little over eight pounds, complete with radio, and still managed to fly with a Brown Jr. ignition engine, a power source that is about the equivalent of a modern .29 two-stroke glow engine. Granted, it usually needed manual assistance during takeoff, so you may want to use a .40 two-stroke or a slightly larger four-stroke, but keep it at that. This was a slow and majestic aircraft that made history. It's not Rodney Dangerfield; treat it with respect!

With John Gunsaullus launching, Walt Good begins takeoff of Rich Bonnell's Enya .46 four-stroke-powered Guff replica.

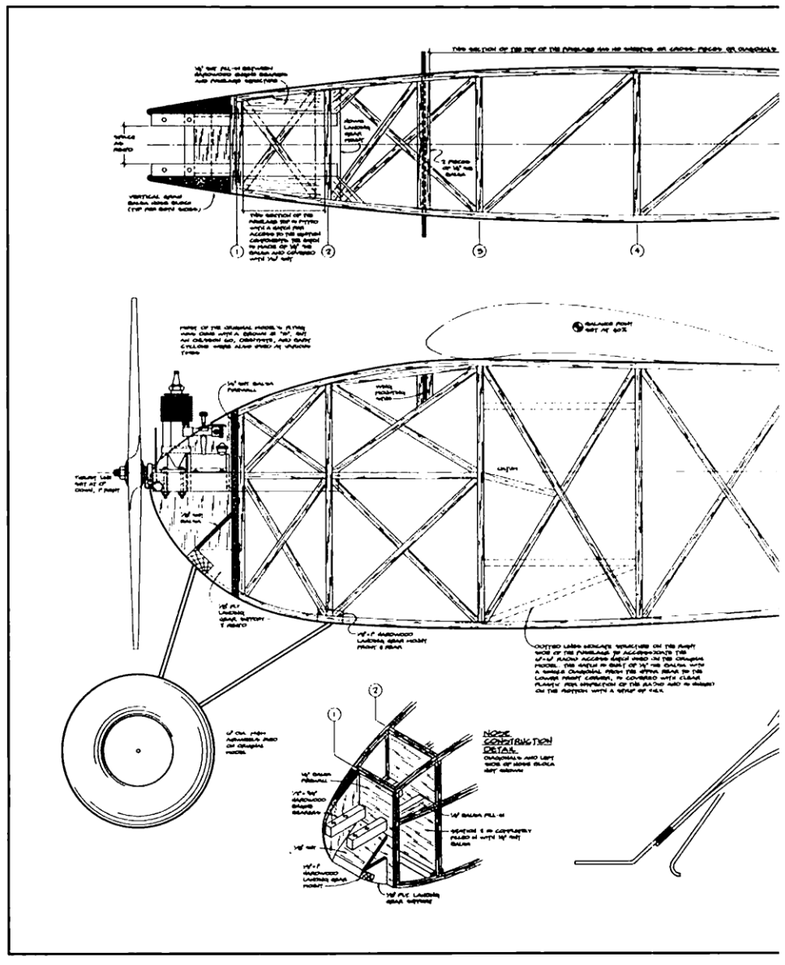
Radio control of a model plane is a new and fascinating hobby. Every modeler dreams of controlling his own models, and it is hoped his enthusiasm will be livened by the presentation of this thoroughly proven radio-guided model. Over 150 flights have been executed with the equipment described, so only those things which have been tried and found successful will be included. In many of these flights, the plane was returned to within a few feet of the takeoff; that's a real thrill, especially when *you* are doing the controlling.

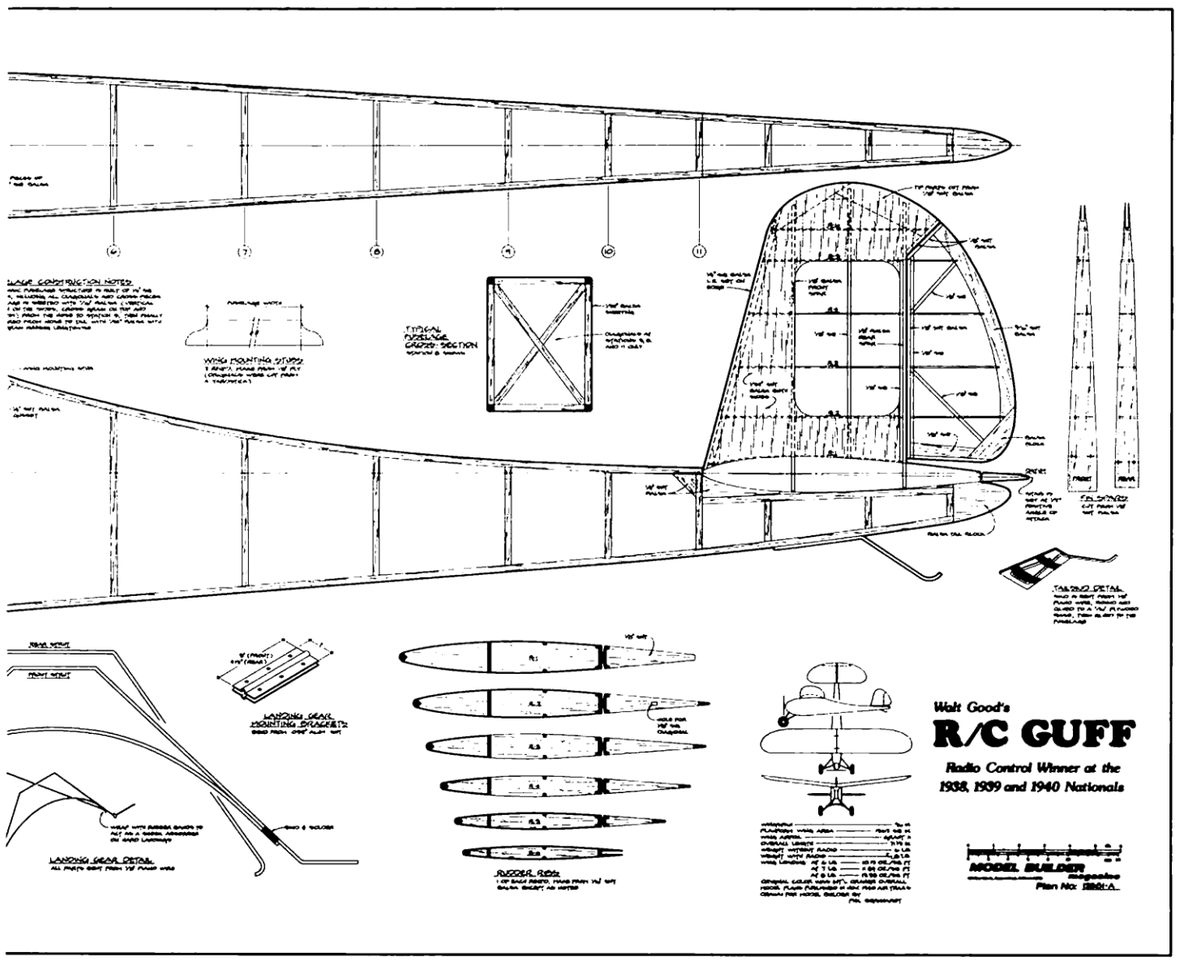
The present ship carries two controls, rudder and elevator. It is suggested, however, that a rudder control alone is an adequate beginning. Complications arising from two controls are apt to be discouraging. Interestingly enough, the 1939 Nationals were won using only the rudder control. Simplicity is the keynote throughout the entire construction. Most modelers yearn for the super complete complex radio job. Try a simple one first.

Several years of experimentation have shown that the ship itself is as important as the radio unit it carries. Naturally, the weight must be carried easily. The glide and power flight speeds should be nearly equal to give the same response to control under both conditions. Side area considerations result in good turns to right and left. And finally, properly sized control areas are indeed essential.

In spite of its largeness, this ship is powered with a 1/5 hp Brown motor. It may be noted the ship has the same characteristic fuselage shape as the author's Guff. This seems to aid the spiral stability.

On a low, slow, fly-by approach prior to setting up a landing pattern. Note wheels are in the old prop-saver position.





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Walt enjoyed flying the Guff in its normal, old, slow style.

of glue along its edge to fuse it to the sheet beside it. As much as a four-inch wide slab can be put on at one time. Again sand and now cover the whole body (even over the 1/16-inch sheet) with 1/32-inch sheet with the grain running the length of the fuselage. Use as wide sheets as obtainable and cover about two sections at a time. A paint brush instead of a glue stick will help here. Sand the balsa sheet carefully and give two coats of clear dope, sanding lightly after each. One or two coats of your favorite colored dope finishes the fuselage. The original ship is deep orange trimmed with Curtiss blue.

The hatch of the ignition compartment is made of 1/4-inch square framework and is covered with 1/16-inch sheet. Two pins hold it in place.

The transparent inspection panel, of 1/4-inch stock, is covered with cellophane. A silk hinge connects the door to the body.

TAIL SURFACES

The rudder and elevator are constructed separately and joined together when finished.

The movable rudder flap is built apart from the stationary fin. Spars of the fin are of hard 1/8-inch sheet. The rear spar has two strips of 1/8-inch square glued to its front side for strengthening.

Fin Ribs 1, 1A, and 5 are of 1/8-inch sheet, while the rest are of 1/16-inch material. Cement the ribs to the spars. Fit Rib 1 as closely as possible to the curve of the elevator airfoil, filling in the gaps with 1/4-inch soft sheet.

The 1/4-inch square leading edge is not rounded until after the sheet covering is applied.

The trailing edge of the rudder and the tip of the fin are 1/8-inch sheet. Notch the fin spars to receiver the tip.

Cover the indicated portions with 1/32-inch sheet balsa, running the grain parallel to the spars.

Keep the rudder flap light for easy flapping. Its spar has the back face reinforced with two strips of 1/8-inch square. Notch the trailing edge to take ribs.

Heavy-duty common pins are glued firmly to the upper and lower ends of the rudder spar, and project 1/8-inch. These are the pivot pins and they turn in holes in thin

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At R/C World in Orlando, Florida, the fliers get together with the Guff replica for a family-style photo: Walt Good, John Gunsaullus, and Rich Bonnell, builder of the replica model.

FUSELAGE

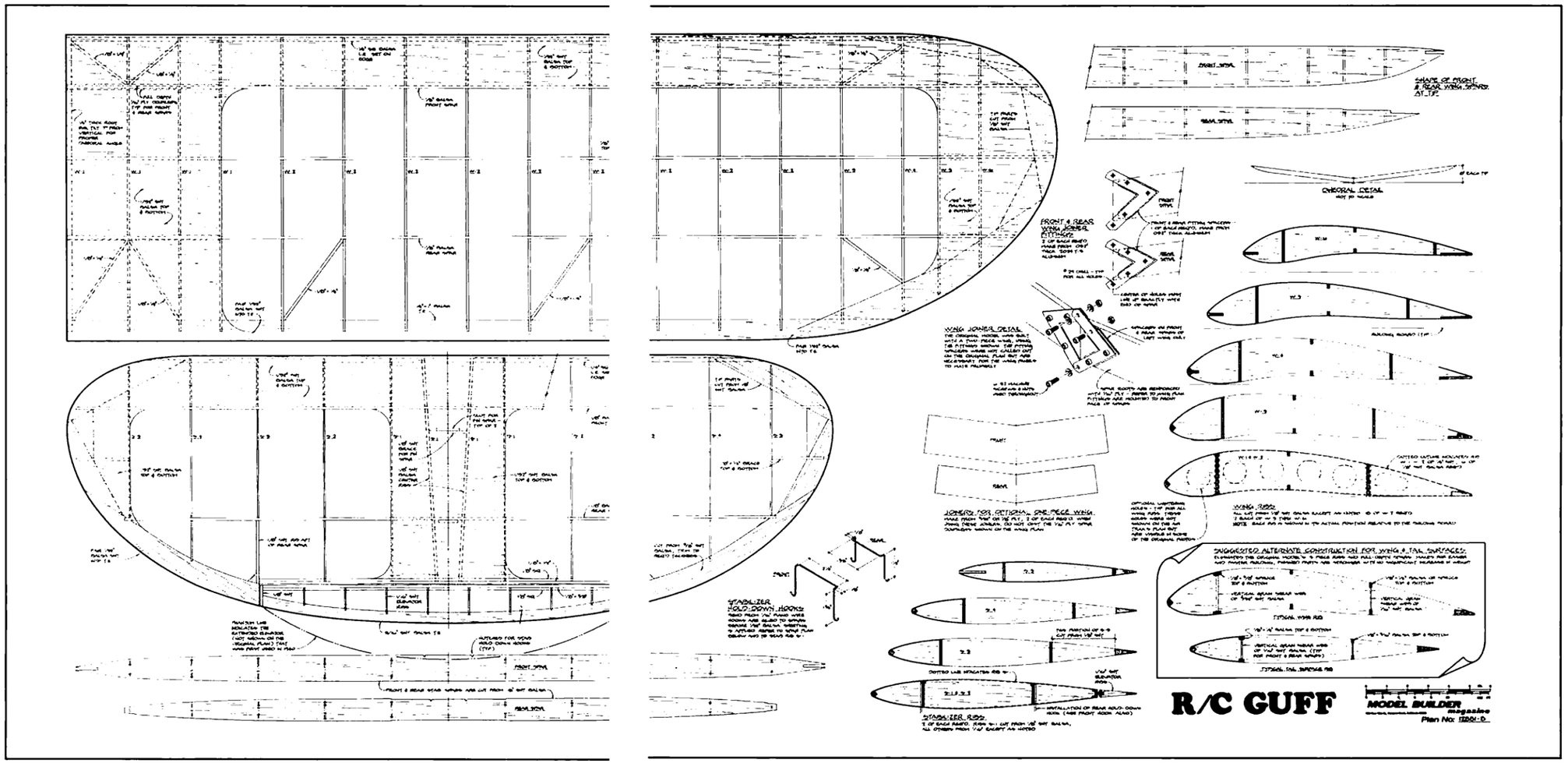
The body is of the strong semibox construction, covered with sheet balsa.

Find a large space (the body is over 5-1/2 feet long!) to work, and tack the plans to a soft board. Build the two sides, one on top of the other, of 1/4-inch square hard balsa. Remember, the right side has a door; the left hasn't.

Assemble the sides in two steps. Invert the two sides and pin the wing-mount portion to the board, gluing in all cross braces forward of the back wing stub. With the body right side up, pin the rear bottom portion of the fuselage to the board and put in the remaining braces. Several coats of glue on all joints is now (rather now than later) advisable. Place diagonals (not shown in drawing) of 1/4-inch square across the body at Stations 5, 8, and 11.

The stabilizer cradle is made of soft 1/4-inch sheet shaped to the rib outline. Since the cradle determines the angle of the stab, follow the dimensions carefully. The tip of the body is carved from a soft balsa block and glued in place.

Hardwood motor mounts are glued in place with the aid of the fill-in blocks. The whole front of Station 1 is covered with 1/4-inch sheet balsa. Station 2 is also filled in, isolating the ignition equipment from the radio compartment. After putting in the bass (or other hardwood) landing-gear blocks, coat the whole nose with glue. Repeat several times until a glasslike finish is had. This prevents oil from undermining the nose structure. Also use plenty of glue wherever the motor mounts come in contact with the balsa structure. After sanding the entire body, removing all projects, the body is ready for its sheet-balsa skin. The front portion of the body, sides and bottom, from nose to Station 5, is covered with 1/16-inch sheet with the grain running across the body. To put on these pieces, coat well with glue all members under the sheet. Just before shaping the sheet in place, run a ribbon



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sheet metal fastened to the fin (at P). The hole may be punched with the pivot pin for correct size. Make sure the flap turns easily, but allow no looseness. Glue the piano wire rudder arm strongly to the flap.

The stabilizer has three spars: front, rear, and trailing edge spar. The latter is just ahead of the elevator tab. All spars are 1/8-inch hard sheet. Be sure they are straight. Section A-A shows the streamline rib profile. The ten center ribs are cut to this shape. Note the two center ribs are of 1/8 inch sheet and are angled to the taper of the fuselage. Each tip rib is made by the "cut and try" process after the tip is in place. Since the spars cut all the way through the ribs, it is necessary to slice each rib into three pieces.

Start assembly by gluing center portions of ribs between the two spars, making sure there is no warp. When dry, attach remaining rib portions. Cement on 1/4-inch square hard balsa leading edge and 1/8-inch sheet tip. Wire hooks, with the aid of rubber bands, hold the tail assembly on the fuselage. So, use plenty of glue when placing the hooks. Cover the indicated portions, top and bottom, with 1/32-inch sheet balsa.

The trailing edge of the elevator flap is easily cut from a sheet 1/8 x 2 inches. In fact, all 1/8-inch sheet tip pieces can be cut from 2-inch width material. This flap has pivot pins at the front edge the same as the rudder. Sheet metal bearings at P.

Cover all tail surfaces with bamboo paper and water spray. Two coats of clear dope is sufficient. Cut holes in tail wing for fin spars. Glue fin in place and give the whole thing one coat of colored dope. Don't worry about warp, if you've built the framework true, parts are just too stiff!

WING

The eight-foot wing is in two sections for convenience of transportation; that is, to fit the family car. Four small nuts and bolts (6-32) hold the assembled wing together. This system has proved satisfactory, even through much hard usage.

Select hard, firm balsa for the spars, front and back. If four-foot lengths cannot be obtained, splice shorter ones together with a long diagonal joint. The root of each spar is reinforced on each side with a sheet of 1/16-inch plywood. To this firm base bolt (6-32) and glue the dural wing fasteners. Each rib is cut into three parts to allow for passage of the deep spars. First assemble the center rib portions and the two spars. This insures having the spars parallel. Remember the 1/4-inch root rib goes on with a slant to give the proper dihedral. Next add the nose ribs and leading edge. The 1/4-inch false nose ribs strengthen the place where the wing rubbers go. Now glue the trailing ribs to the rear spar and before the glue is dry add the notched trailing edge. (*Editor's Note: Our plans show a one-piece rib for more conventional construction, along with suggested spars and webbing.*)

The wing tip of hard 1/8-inch sheet is assembled on a flat surface and then glued to the wing. By the "cut and try" method, hack the two tip ribs to the proper size. Holding a straight edge (parallel to spar) on top of tip ribs will help indicate the correct taper.

Add the various braces shown and give all joints an extra coat of glue. This wing will take a beating. The medium 1/32-inch sheet balsa covering is placed on top and bottom of portions indicated. Cover with bamboo paper and finish as with tail assembly. The external holes in the dural fasteners are drilled while holding the two panels in position to insure perfect alignment.

The ship is found easy to fly and should be flown before the radio is installed. If the ship itself is well tested, the radio installation will be much easier.

Balance the ship at the 40-percent mark on the wing (about 5 inches back from leading edge). Set everything neutral except for about one degree right thrust on the motor. A good test is 2/3 power and 30-second motor run. A few glides from the hand will detect any extreme misadjustment.

Run beside the wing tips on a few power runs, letting the ship take off but not allowing it to go free. When satisfied with the adjustment (but not until!) let her go.

The climb will be slow and the glide flat. Try for straight-line power flight and glide with neutral rudder.

Now for the fun of putting in the radio control! •