DOUBL

A trainer is a trainer is a trainer. Well, not always. This low-winged tutor can virtually fly itself, or it can be fitted with its alternate wing to carry the new student on through the next phase of learning to fly RC. For 3- or 4-channels and .10-.15-size engines. ■ L. F. Randolph

DESIGNED TO PERFORM the dual role of both basic hands-off trainer and advanced aileron trainer, this aptly named model can adapt its flying to suit almost everyone's style.

In the three-channel configuration it is a very gentle and stable training machine. It will recover from almost any attitude all by itself if the controls are allowed to return to neutral and there is 75-100 ft. of altitude. Turn entry is smooth with little of the "tail wagging" associated with rudder-only airplanes. Quite creditable rolls can be done with the properly-timed application of down elevator.

It flies for a long time on a small amount of fuel and is inexpensive to build and maintain. It is light enough to turn crashes into hard landings with little damage. The landing gear is long enough to protect the prop, making the model ideal for grass fields. Best of all, it doesn't look like a "first airplane," and by switching to the flatter aileroned wing, it converts to an excellent aileron trainer.

CONSTRUCTION. As a general rule, wings are the first things we think of when we think of an airplane. For that reason, if for no other, let's start by building it first.

The ribs are cut from 1/16 balsa sheet. They can be cut from a printed sheet made by tracing around a card stock template with a fiber-tipped pen, or they can be cut all at the same time by stacking balsa blanks together, tracing the rib pattern on top, and sawing them out with a band or jigsaw. If you choose the printed sheet route, the ribs should be stacked together after they are cut from the sheet and gang-sanded to smooth out any high or low places that might have crept in during the slicing.

Select two ribs and trim 1/16 in. from the top and bottom of each to make them the center-section ribs. Cut the webs from 1/16 sheet, notice that the grain runs vertically. Webs add greatly to the strength of the spars while adding very little weight. The spars can be purchased, but it's preferable to strip them from the appropri-

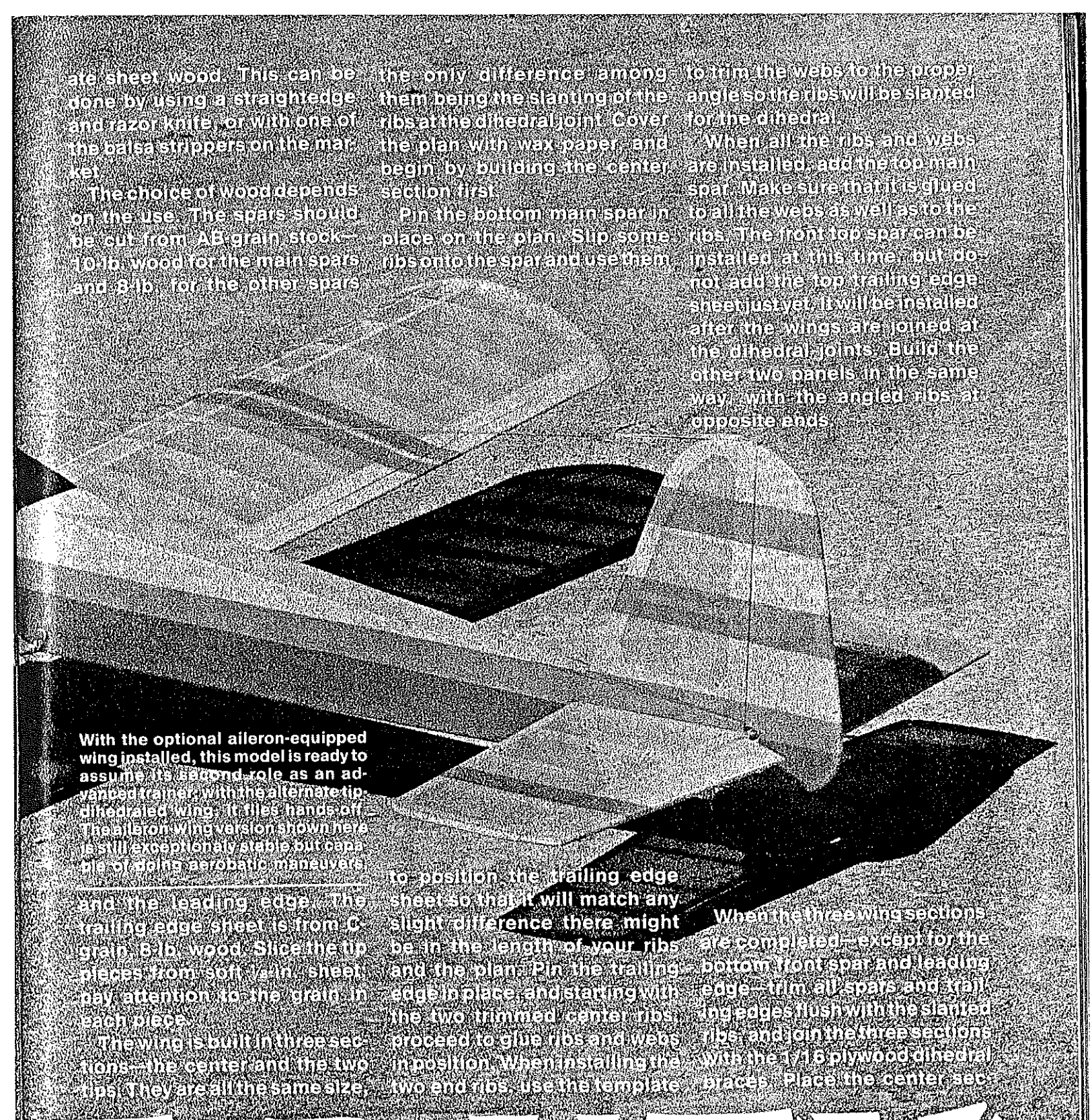
are sheet wood. This can be done by using a straightedge and razor knife, or with one of the balsa strippers on the market.

The choice of wood depends on the use. The spars should be cut from AB grain stock—6 lb. wood for the main spars and 8 lb. for the other spars and the leading edge. The trailing edge sheet is from C-grain 8 lb. wood. Slice the tip pieces from soft 1/4" sheet. Pay attention to the grain in each piece.

The wing is built in three sections—the center and the two tips. They are all the same size, the only difference among them being the slanting of the ribs at the dihedral joint. Cover the plan with wax paper and begin by building the center section first.

Pin the bottom main spar in place on the plan. Slip some ribs onto the spar and use them to position the trailing edge sheet so that it will match any slight difference there might be in the length of your ribs and the plan. Pin the trailing edge in place and starting with the two trimmed center ribs, proceed to glue ribs and webs in position. When installing the two end ribs, use the template to trim the webs to the proper angle so the ribs will be slanted for the dihedral.

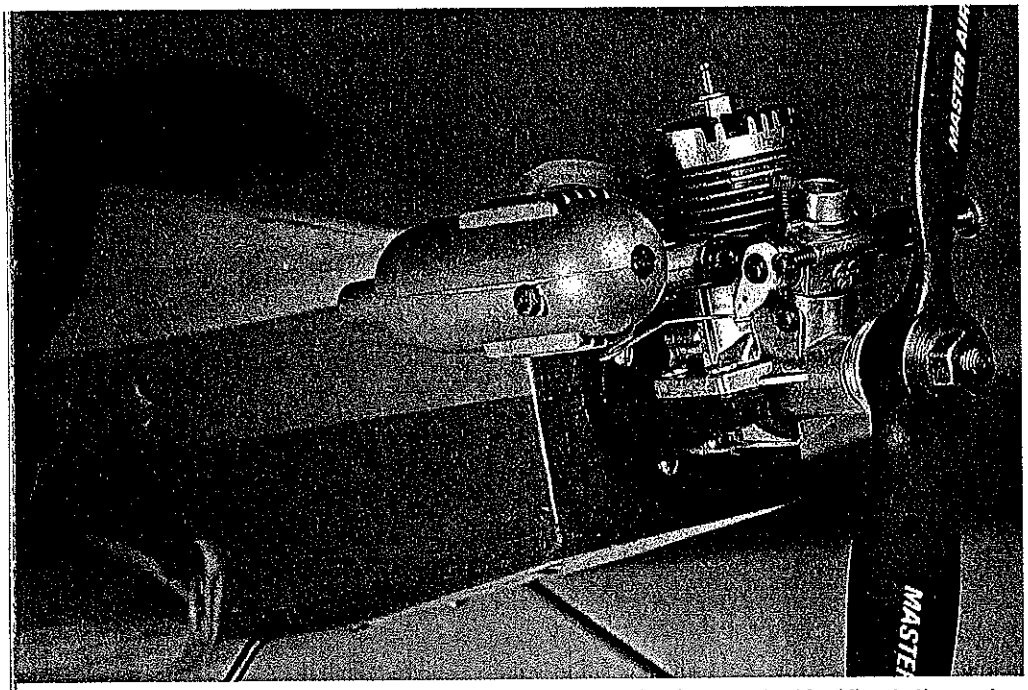
When all the ribs and webs are installed, add the top main spar. Make sure that it is glued to all the webs as well as to the ribs. The front top spar can be installed at this time, but do not add the top trailing edge sheet just yet, it will be installed after the wings are joined at the dihedral joints. Build the other two panels in the same way, with the angled ribs at opposite ends.



With the optional aileron-equipped wing installed, this model is ready to assume its second role as an advanced trainer with the alternate tip dihedrated wing. It flies hands-off—the aileron. The version shown here is still exceptionally stable but capable of doing aerobatic maneuvers.

When the three wing sections are completed—except for the bottom front spar and leading edge—trim all spars and trailing edges flush with the slanted ribs and join the three sections with the 1/16 plywood dihedral braces. Place the center sec-

EDUTY



Muffler pressure is easy to come by and helps to maintain a constant fuel flow to the engine. The throttle control linkage has a U-shaped bend in it (just below the exhaust stack) which acts as an adjustment and provides a strain relief for the servo should something bind.

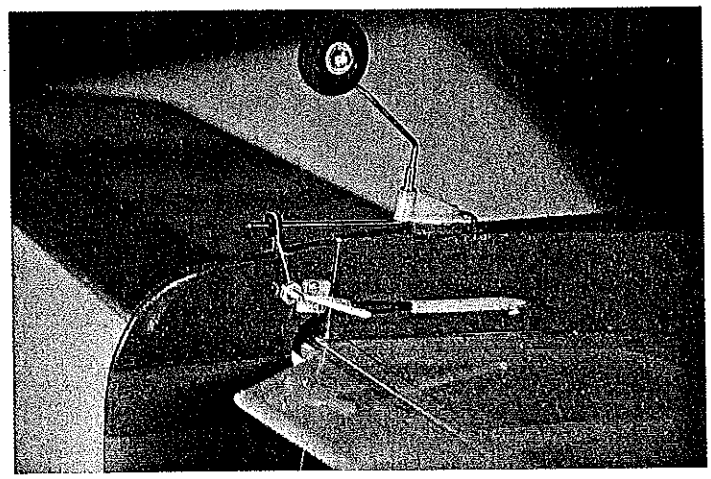
tion flat on the bench, and elevate the outboard ends of the two tip sections 6 in. to match the angled ribs. Using a sharp razor, slice 1/16 in. from the joined ribs on each side of the main spars to fit the plywood dihedral braces. Install the braces and check for fit; then glue all joints. When everything is dry, install the bottom front spar and the leading edge.

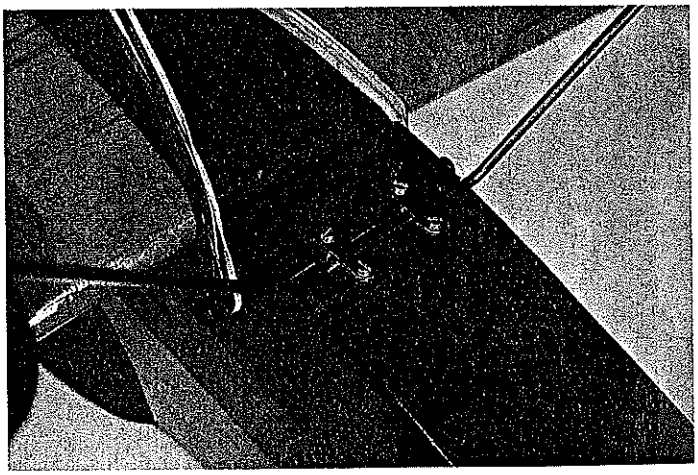
The tips are glued to the two tip ribs. Notice that they slant upwards to become flush with the top of the top spar stubs. Use scrap spar material to fill in between the bottom main spars and the tips. Sheet the center section between the spars, and sand the completed wing.

The stab and rudder are built right over the plan just as with the wing. The two 1/32 plywood spar doublers should not be eliminated, for they add much strength in this area. The plan shows 1/16-sq. hardwood for the elevator carry-through, but 1/16 dowel will work as well. When complete, join the mating surfaces, and sand the outlines to match.

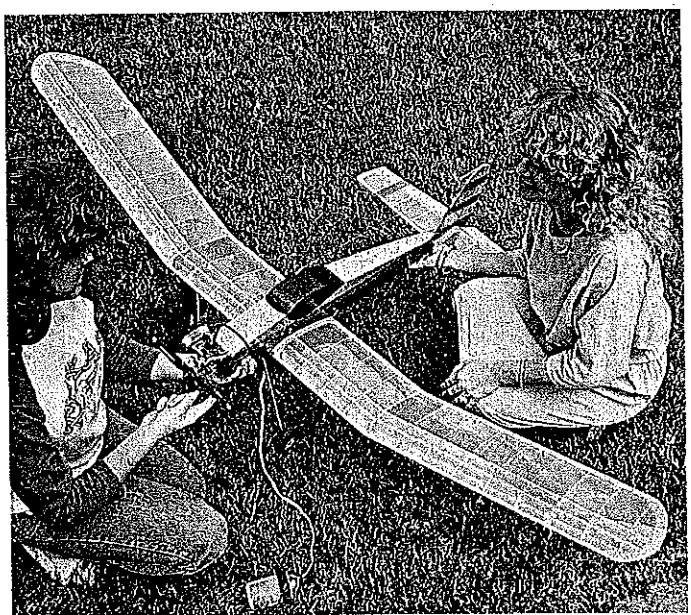
Fuselage. The fuselage sides are cut from medium (8-lb.) 1/32 balsa sheet. Don't cut the wing saddle into the sides until after the doublers are glued in place. The doublers are also 1/32 balsa—this time hard-stock—laid at a 45° angle to the grain of the sides. When the doublers are cemented in place, pin the two sides together and sand them to the same outline with a sanding block and 100-grit sandpaper. While they are still pinned together, cut the wing saddle, and drill the 1/4-in. holes for the wing-mounting dowels.

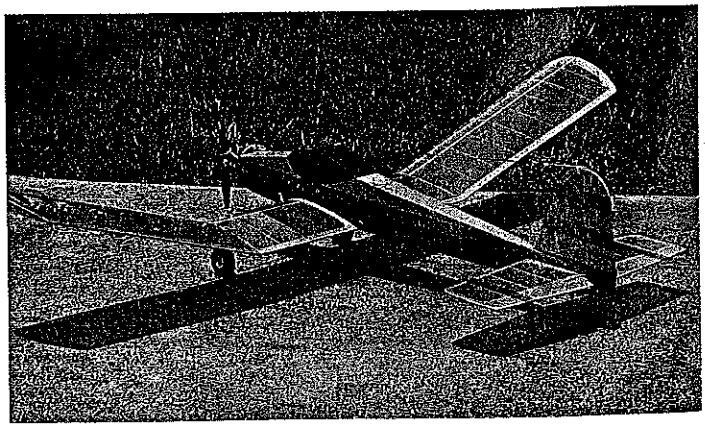
Separate the sides, and add the 1/32-sq. longerons and uprights as well as the servo- and tank-mounting rails. Cut out and drill the firewall and the two cabin formers, epoxy "T" nuts on the back side of the





Left: By using a tiller-type of tail wheel steering, the load on the rudder hinges is greatly reduced; ground handling is smoother and more responsive. Right: A torsion bar landing gear is easy to install, and it absorbs a lot of the pain incurred from hard landings. Use of this type of landing gear is necessary to simplify wing changes when switching from three-channel trainer to four-channel aerobatics trainer.

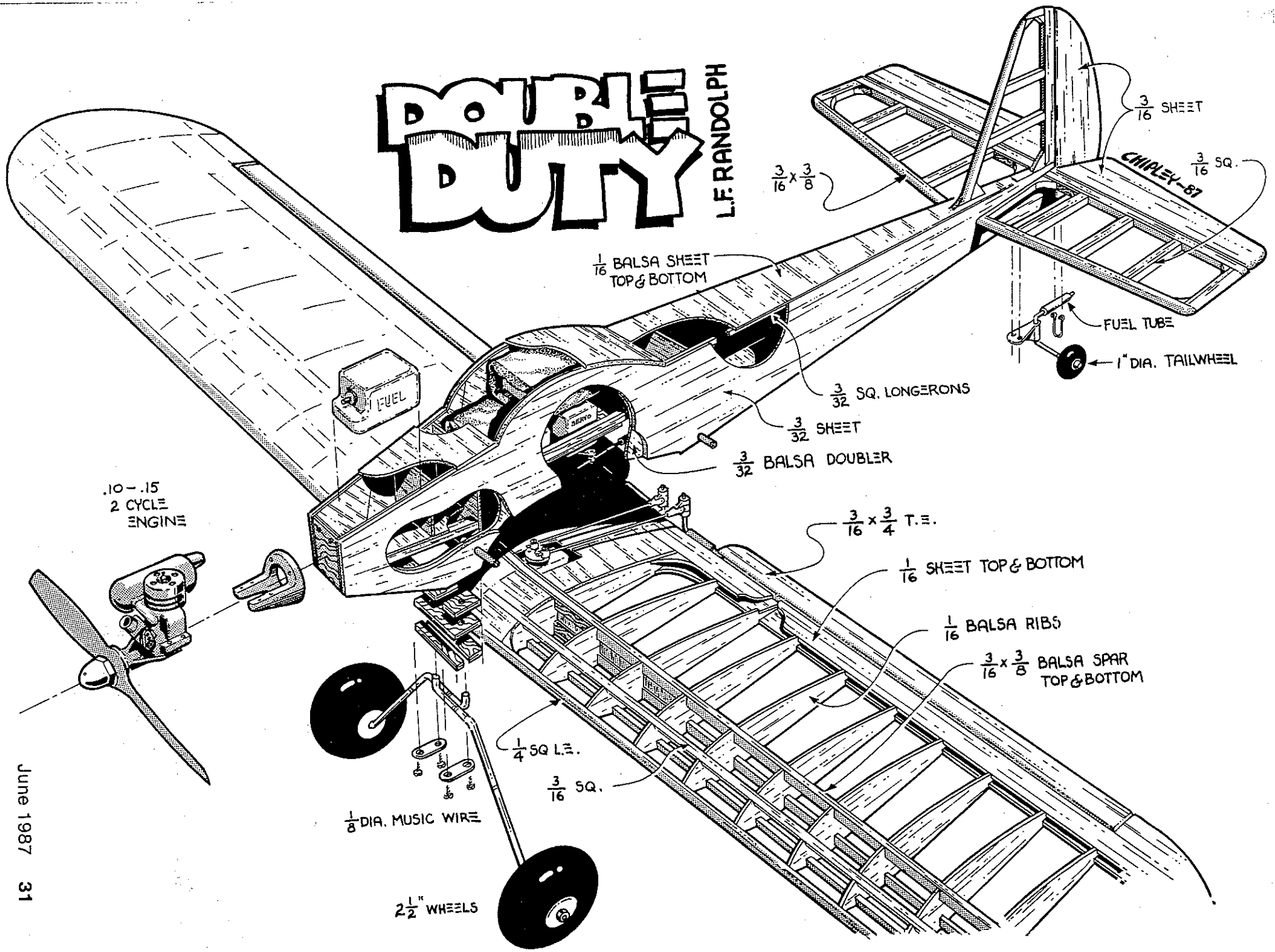


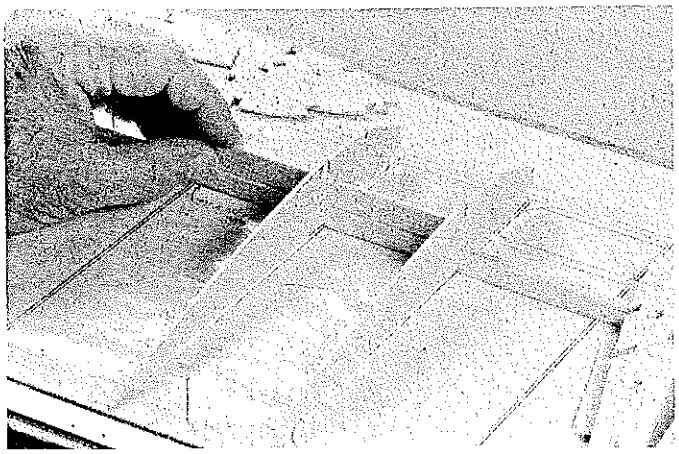


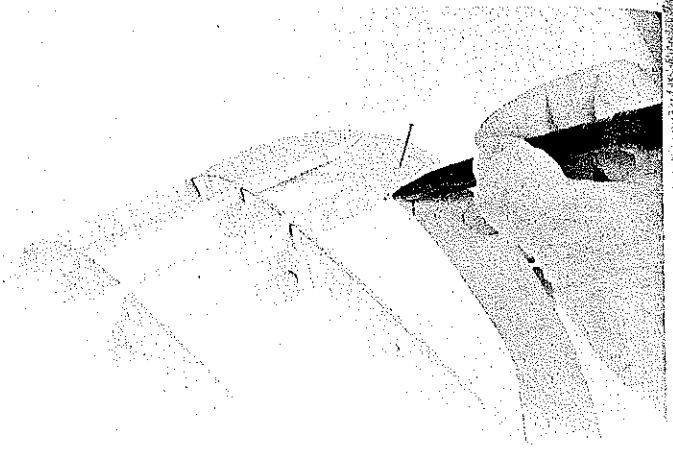
Left: Sheri Smothers cranks up Double Duty while Leslie Lurich holds. Model is an excellent three-channel trainer, as these women will attest. Above: The generous tip-dihedraled wing gives the Double Duty a flying sense of its own and the ability to recover from the worst attitudes if given time. That can save the new flier.

DOUBLE DUTY

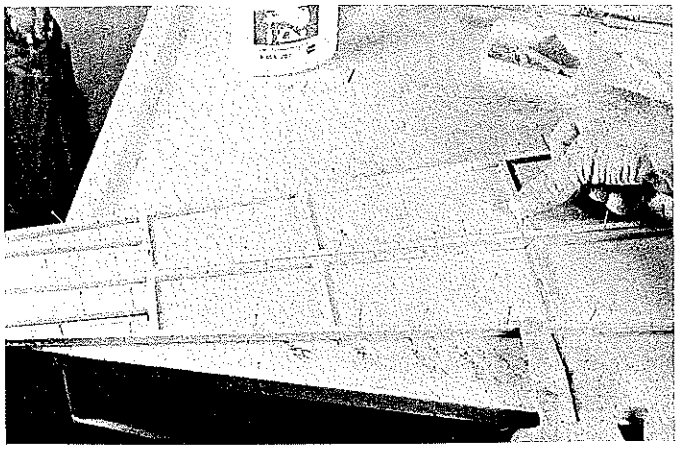
L.F. RANDOLPH

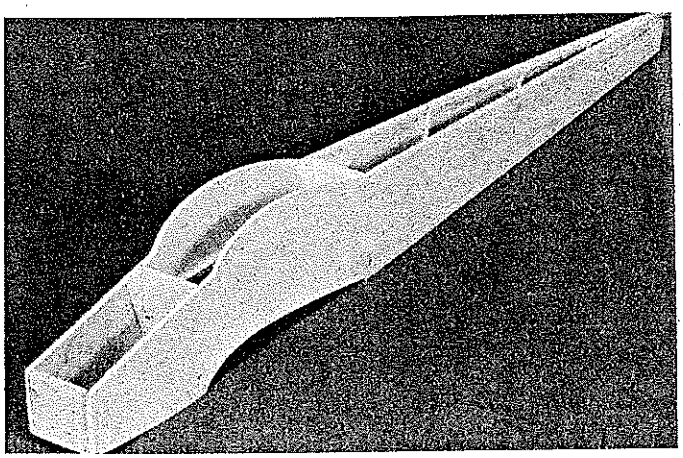




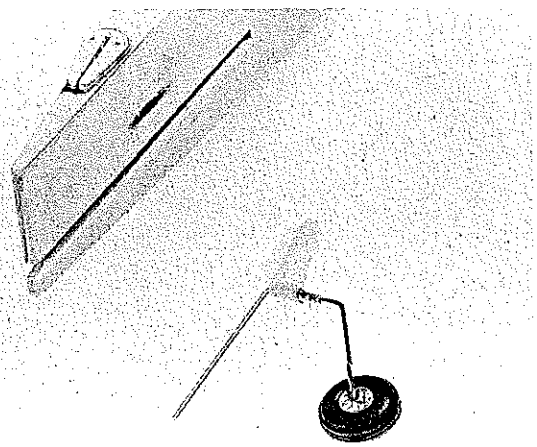


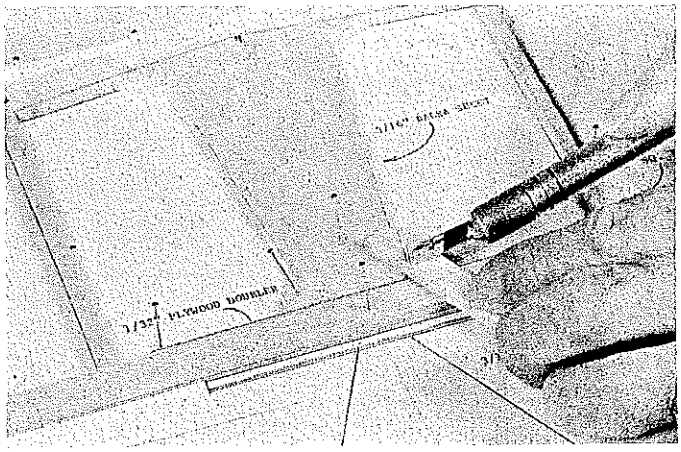
Left: Trim 1/16 in. from both the top and bottom of the two center ribs to allow for the center-section sheeting. Adding the webbing during the initial assembly helps keep the ribs vertical. Right: The tip bows slant up to blend in with the airfoil. Trim the top spars to butt against the flat side of the bows. The bottom spars are cut flush with the tip rib, and scrap 3/16 balsa is used to fill in between there and the tip.





Left: The bottom of the fuselage is flat. If both fuselage sides are joined, bottom to bottom, it is quite easy to assemble the uprights and keep both sides the same. Use medium 3/32 balsa for the longerons and uprights. Right: The simple box fuselage uses only the firewall and two formers to join the sides. The throttle line and Ny-Rod guides should be installed at this point in construction. Drill firewall before joining.





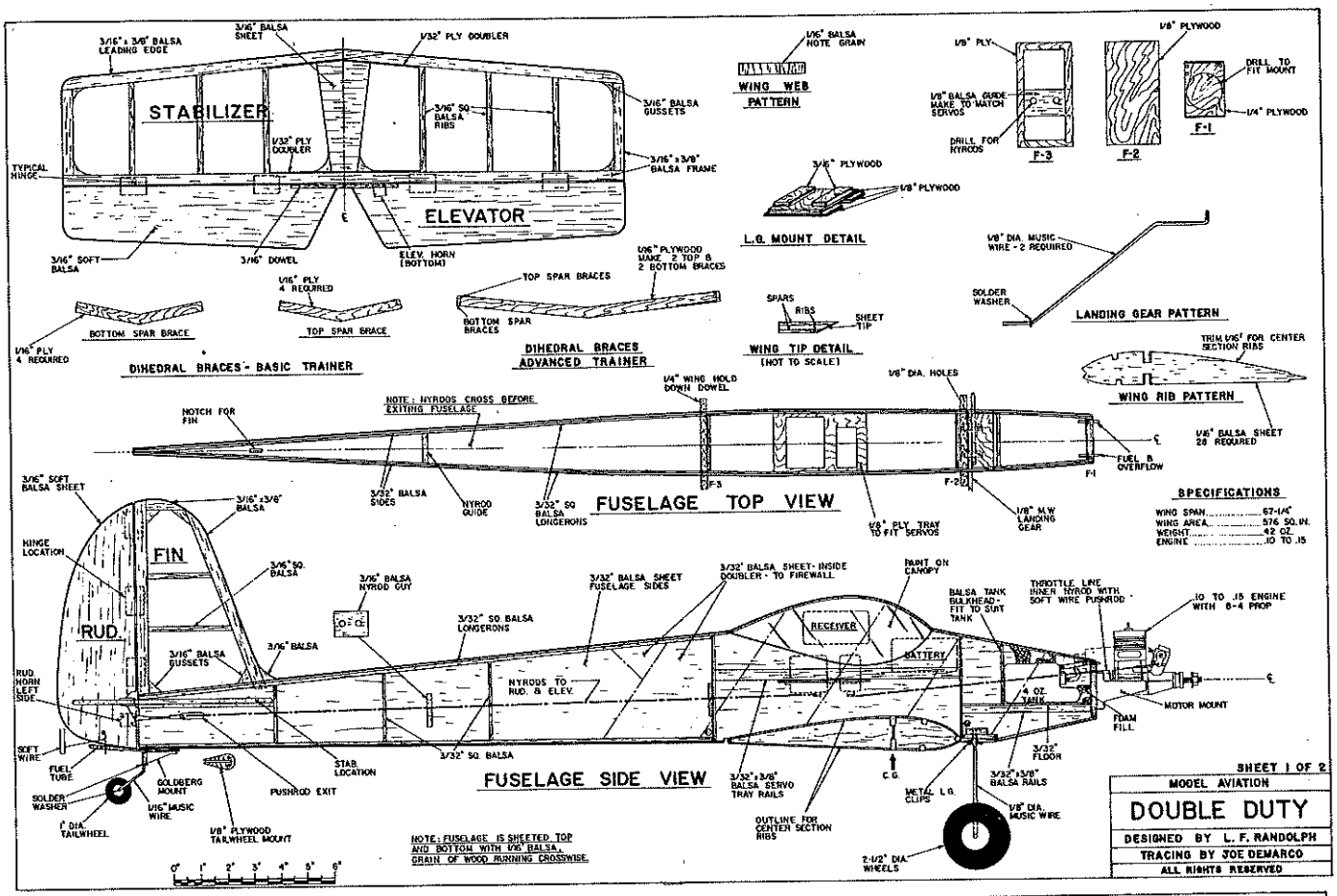
Left: A 1/8-in. plywood tail wheel pad is cut out and mounted after the fuselage top and bottom have been sheeted. The pad allows free movement of the tiller without modifying the tail wheel mount. Right: Gussets at odd angles can be cut by holding the stock over the desired location and marking the outline of the gusset with a razor knife. The grain in a gusset should always run at a 45° angle to the joint itself.

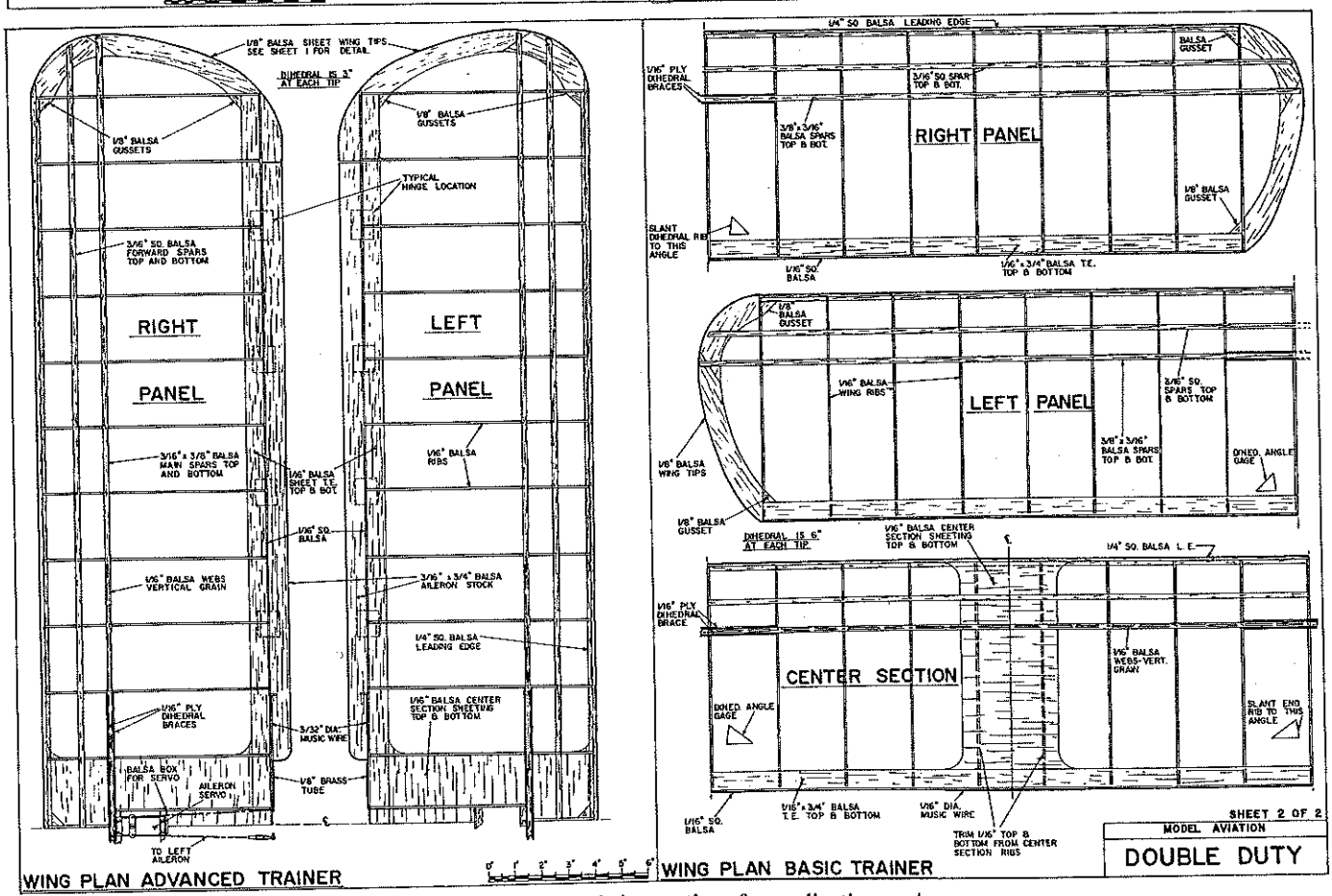
firewall for the mounting bolts, and start assembling the fuselage by gluing the two cabin formers in place on one of the sides. Make sure they are perpendicular to the side by checking with a right triangle. When dry, glue the other fuselage side to the formers, being sure it is in perfect alignment with the first. Bring the tail together and glue. When dry, mount the firewall. I prefer to use epoxy to hold the firewall in place.

Sheet the bottom of the fuselage from the back of the wing saddle to the tail with 1/16 balsa, with the grain running across the fuselage. At the very tail the balsa is replaced with 1/16 plywood for the tail wheel mount. Build up and glue the landing gear mount in place just in front of the first cabin former. Install the Nyrod guides from the cabin area to the tail. Drill the Nyrod supports, and trim them to fit between the fuselage sides. Slip them over the Nyrods, and epoxy them in place.

Epoxy the 1/8-in. copper-tube fuel and overflow lines, as well as the throttle line, through the firewall, and install the floor in the tank compartment. Wedge the tank in place with foam, and connect it to the copper tubes with fuel tubing. Watch for and eliminate any kinks in these lines. Finish the cross-grain sheeting, and sand the completed fuselage.

The original was covered with Mono-Kote, and that material is suggested if you





are new to modeling. If you are an old-timer, a good alternative would be Mica-film, which is a very light and strong covering. Whatever you choose, follow the manufacturer's instructions for application. The rudder and elevator hinges on the original were made from MonoKote; but hinge the surfaces in the way most familiar to you.

Trim the covering away from the center of the stab where it is covered by the fuselage, and epoxy it into the slot pro-

vided. Epoxy the fin and rudder to the fuselage in the same way. Trim the covering away, and epoxy the ¼-in. wing-mounting dowels in place.

Cut out the ⅛-in. plywood tail wheel bracket pad, epoxy it in the location shown, and mount the tail wheel with epoxy and small wood screws. Bend the U-shaped tiller-holder, and slip a piece of fuel tube over the tiller before capturing it in the holder and attaching it to the rudder.

Before bolting the engine mount to the firewall, it is a good idea to paint the firewall with a coat of epoxy. When the engine is mounted, attach the fuel line to the carb and the overflow line to the muffler pressure tap. Run a piece of soft iron wire through the throttle Nyrod, and connect it to the throttle arm. A U-shaped bend in the wire at the arm acts as an adjustment as well as providing strain relief for the servo. Bend up the landing gear legs. Add the wheels, and hold them in place on the gear mount with metal brackets and small wood screws.

Before installing the radio, assemble the airplane, and check the balance point. Move the battery pack and servos around until it balances where indicated on the plans, then install the radio to maintain this balance. Connect the elevator and rudder to the servos with Nyrods, clevises, and horns. Make a Z-bend in the throttle wire to engage that servo. Check to see that everything reacts properly to the transmitter controls. After a range check, the airplane is ready to fly.

Flying. Some taxi time is in order before the first flight to get the feel of the airplane. It steers the same on the ground as in the air. Hold the stick well back while taxiing. You will find that ground handling is gentle and the takeoff roll straight and true.

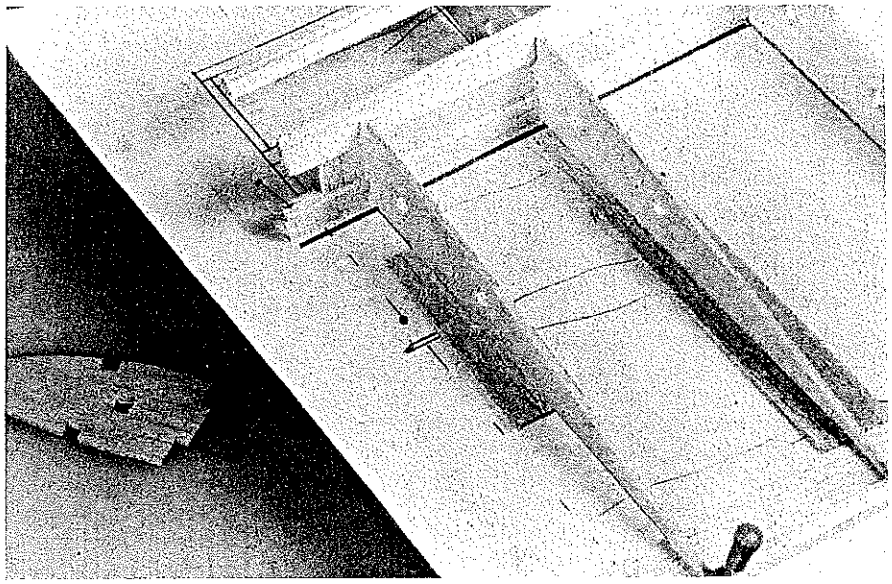
On the first flight, hold it on the ground with a little forward stick until the tail is well up, then rotate. For an airplane of this size with such a small engine, the climb-out is exceptional. If the balance is as shown on the plans and there are no warps, level flight should be well within the trim range of the transmitter. All rudder-type airplanes exhibit some tail wag when a turn is initiated, but you will find the tendency is at a minimum with this machine. Level flight can be maintained with the throttle only two notches above idle.

Landings are almost automatic. Set up the approach, back off on the throttle, and enjoy a graceful sight as she comes into land. A little flare so the tail wheel lands first, and the airplane is down without a bounce!

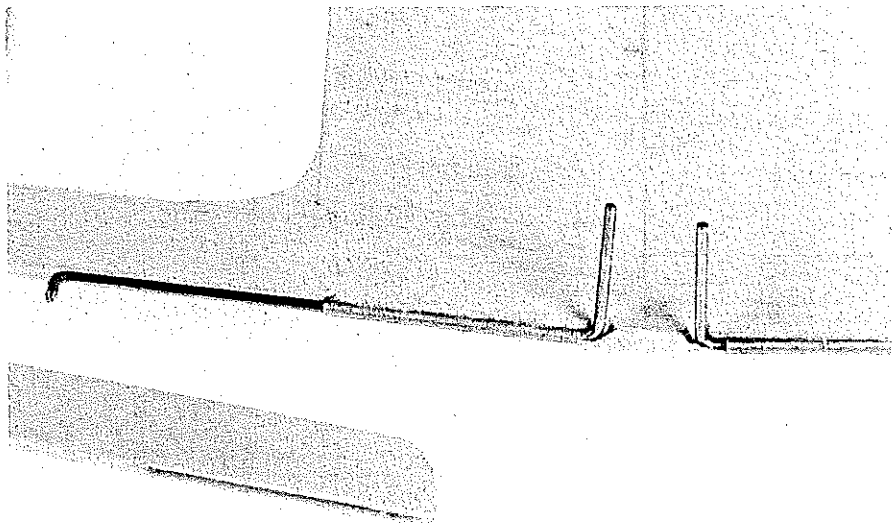
This simple-to-fly configuration lets you teach your friends, wife, or children to fly, and still enjoy flying it yourself—all with a very small investment of time, money and fuel. It should have a long and happy life; mine has.

Ailerons. The addition of a wing equipped with ailerons is a simple and inexpensive

Continued on page 144



The center section of the aileroned wing is treated differently than the tip-dihedraled wing. A well for the aileron servo is formed by separating the trailing edges of the center ribs. Because of their smaller size, lift up the center ribs into proper position with 1/16 shims.



The aileron hardware is simple 1/8-in. brass tubing with 3/32 music wire horns. Slip the tube on the wire before bending. The area between the horns is filled with scrap wood.

Flying by slow and stable, the Double Duty gives the new pilot time to think through decisions that later become instinctive. When those reflexes develop, switch to the aileroned wing.

Double Duty/Randolph

Continued from page 34

method of turning the DoubleDuty into a good and gentle advanced trainer.

Most of the flight characteristics remain the same with the slightly smaller wing, but the stability, almost like that of a Free Flight model, is somewhat reduced by the use of less dihedral in the aileron-equipped wing. Roll response is very smooth, as would be expected; and, of course, the elevator and throttle responses remain the same.

Transition from the three-channel system to the full-house arrangement is really easy; and the "sweaty hands" time is reduced to the first few minutes of the first flight. Confidence is the first thing that is required for comfortable flying—and this airplane is a confidence builder.

Construction. This wing uses the same airfoil and method of construction as the original tip-dihedraled wing. The addition of ailerons and their hardware is about all that is different, so let's start at the point when the two panels are complete and ready to be joined with the plywood dihedral braces.

Notice that the two center ribs—one on each panel—are cut in half at the main spar and that the two nose ribs are joined. The back half of these ribs form the sides of the well that will hold the aileron servo. The front of the well is the main spar; the back is scrap 1/16 sheet balsa trimmed to fit between the ribs. Join the wing panels with the dihedral braces before adding these center ribs, the front bottom spar, and the top trailing edge sheet. The center section is sheeted just as with the original wing, but the top of the servo well is left open. Add the 1/8-in. sheet tips as before.

The ailerons are 3/16 x 3/4-in. stock tapered to 1/16 in. at the trailing edge. Stock can be purchased or sanded to shape. Glue 2½-in. pieces of aileron stock to the trailing edge between the last two ribs. Sand to blend into the tips.

The aileron torque rods are made by slipping the brass tube over the 3/32 music wire, then bending the wire to the shape shown. Note that there is a left and a right. Mark the location of the torque rod arms on the trailing edge, and relieve the trailing edge at these locations with a piece of rolled-up sandpaper to give the arms free movement. Glue the brass tubing in place on the trailing edge; be careful not to get any glue *in* the tubes, and check for proper location—that the left one is on the left side, etc.

Hold the ailerons against the torque rods, and drill the leading edges to match the barbs on the end of the rods. Slightly hollow out the leading edges from these holes inboard to allow the torque rods to seat and thus close the gap between the ailerons and the wing. After the ailerons and wing are covered, mount the ailerons, using epoxy to secure them to the torque rods.

Mount the servo on a plywood tray that is glued to scrap balsa risers at both ends of the servo well. Standard aileron hardware is used to connect the aileron horns to the servo. Plug the servo into the receiver, and check for proper movement. Carefully sight along the wing for warps, and correct any that might have crept in during covering.

The wing should fit perfectly into the saddle on the fuselage. If not, trim the trailing edge of the saddle until it does.

Good flying!

Radio Technique/Myers

Continued from page 39

Another subject: AMA has a continuing effort to collect type acceptance data from the FCC as soon as a piece of equipment qualifies. It hasn't been a roaring success. We have some old type acceptances, but only the Ace R/C, Inc. Silver Seven data is newer than 1980, so far as I know.

The idea here is that information will be stored at AMA HQ and made available to Contest Directors, and others, for the purpose of identifying narrow-band transmitter designs to the people doing contest-entrant transmitter processing. I will print that information as soon as I get it (*if* I get it).

George M. Myers, 70 Froehlich Farm Rd., Hicksville, NY 11801.