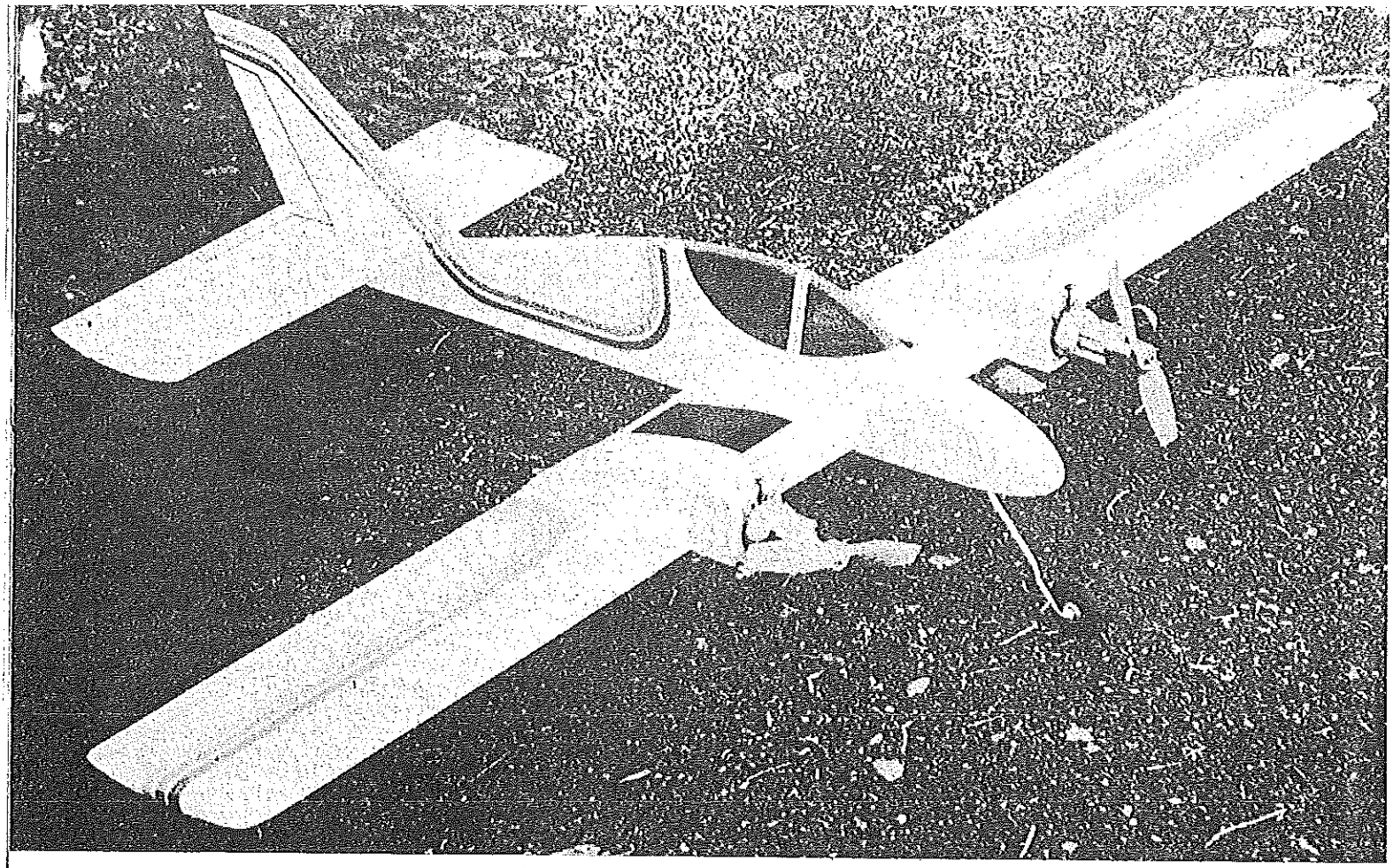


Clarence Haught

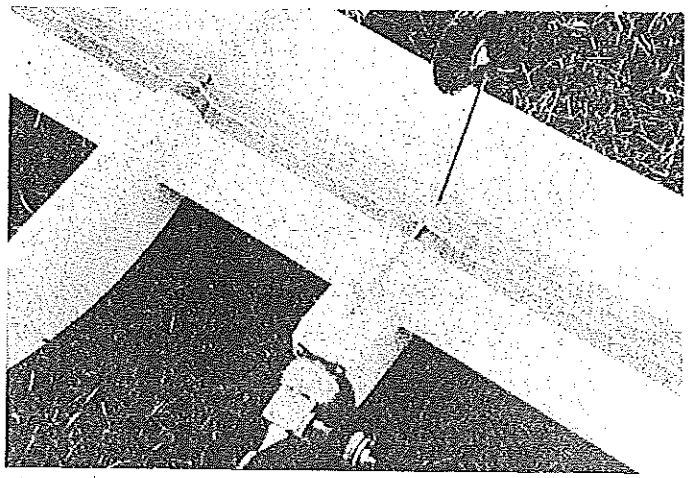
the DERRINGER

IN THE EARLY years of aviation, many flights were terminated due to engine failure. Pioneers were quick to realize the safety factor of multiple engines. Weight, maneuverability, and costs were limiting factors, however. Single-engine aircraft continued to dominate private and small business aviation until the advent of the so-called "light twins" introduced in the 1950s.

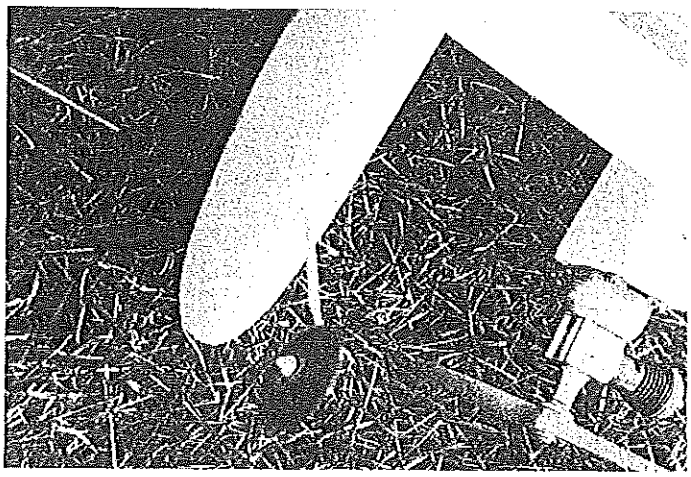
Since that time, there have been a multitude of small twin-engine aircraft offered, at least one with a push-pull engine arrangement, and even a four-engine version by Cessna. Most were designed to carry a minimum of five people upwards to a dozen.

The Derringer, which served as the inspiration of this pseudo-scale model, is deemed by some to be the ultimate in a sport/business twin, as it is uniquely designed for only two people! This design provides the combination of twin-engine safety and the pure fun of multi-engine flight.

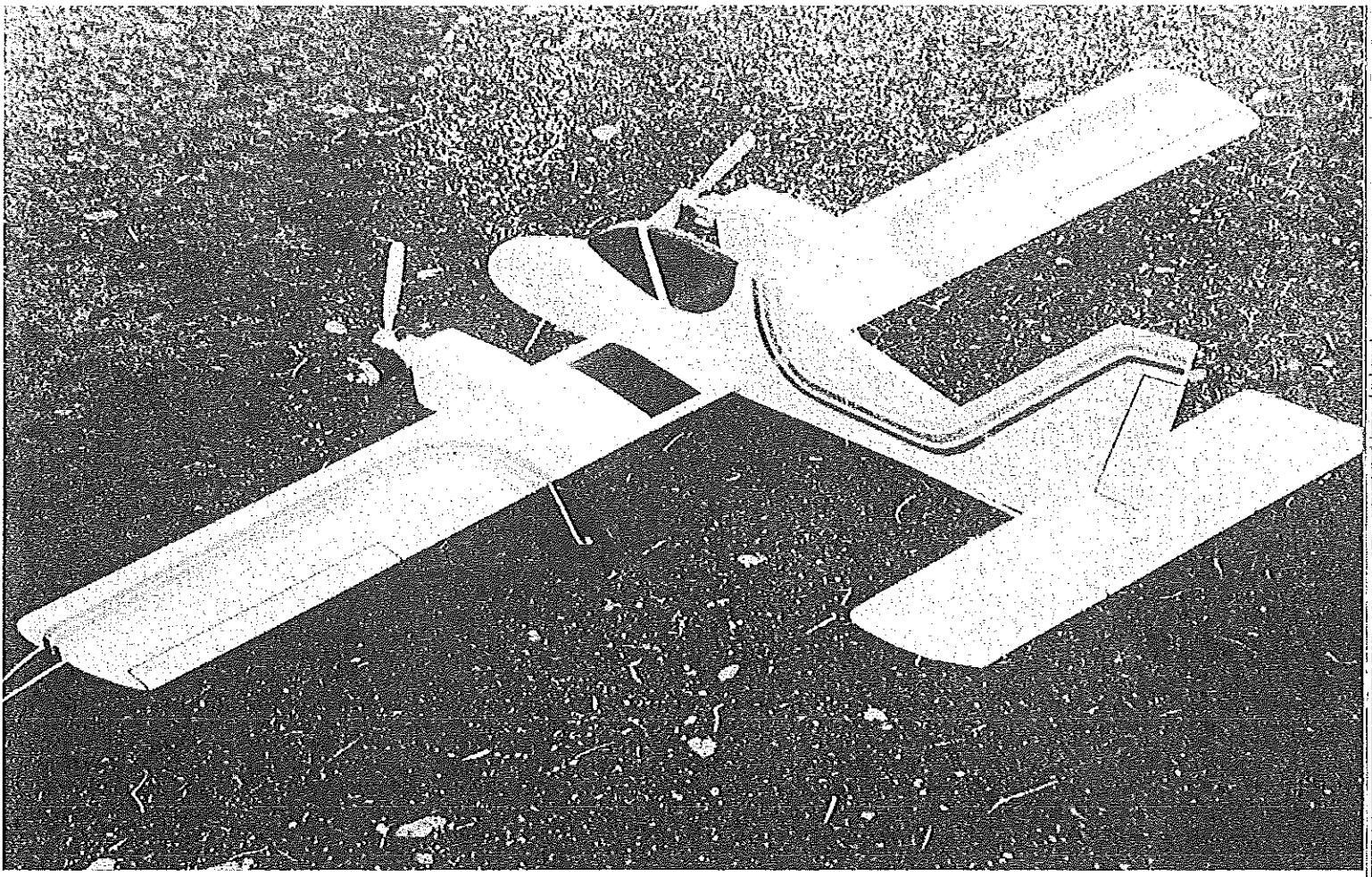
Full-size multi-engine aircraft aren't the only ones that are fun to fly. After mastering basic Control Line flying skills, the addition of a



From bottom side can be seen how the main landing gear wire slips into hole in plywood nacelle bottom, secured with standard nylon landing gear clamps. Retain wheels with soldered washers or wheel collars.



Nose gear is bound with thread to a wood dowel, then glued into hole in nose/doubler. Note firewall angle to provide side-thrust (outward) to engine. Side-thrust is a must on the outboard engine.



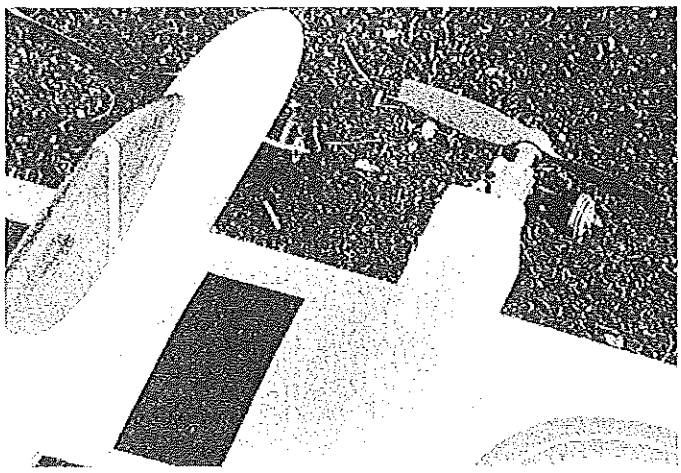
The Derringer is the only two-place light twin on the general aviation market at present. Design is sleek and sporty, demanding of a modern paint scheme. Model's control outlines made from automotive trim tape. Entire fin is angled to provide line tension in flight. Forward-projecting nose gear saves props on rough landings. Model is great introduction to multi flight.

Long for something different in a CL sport model? This twin for mild ½As may be just the ticket. Ideal for a first venture into multi-engines.

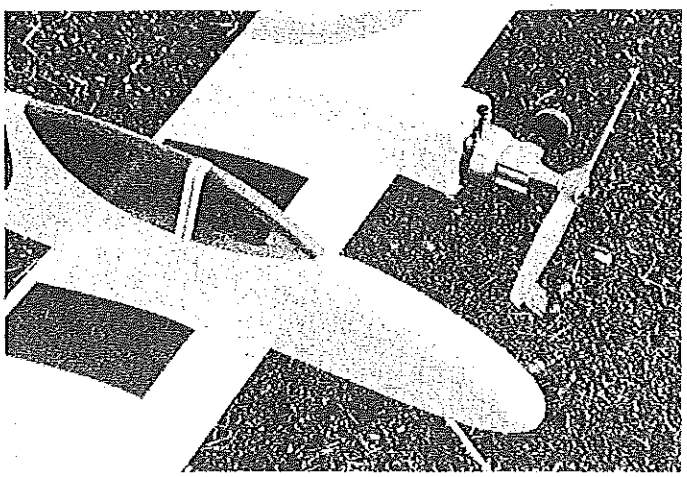
second power plant adds new excitement to modeling. First, there is the neat sound of two engines working in unison; then there's the challenge of maintaining flight on one engine, as fuel is exhausted on one engine before the other; and finally, there is the joy of having something a bit different on the flying field. My son and I have enjoyed multi-engine ½A Control Line for many years, beginning with an old converted-to-twin Ambroid Whipsaw—to a DC-3, an Me 110, a Bell X-P twin pusher, and finally, the Derringer.

The Derringer is intended for a first venture into the world of multi-engine Control Line flight. It has been designed for ease of construction and, most important, accurate alignment of all components. The basic model is constructed right over the plan and pinned to the building board until the final stages of construction. Any modeler who has completed one or two kits, and has mastered basic flying and engine operating skills, should be ready for the Derringer.

Begin construction with the wing. The width (chord) of the wing was designed to utilize 4-in.

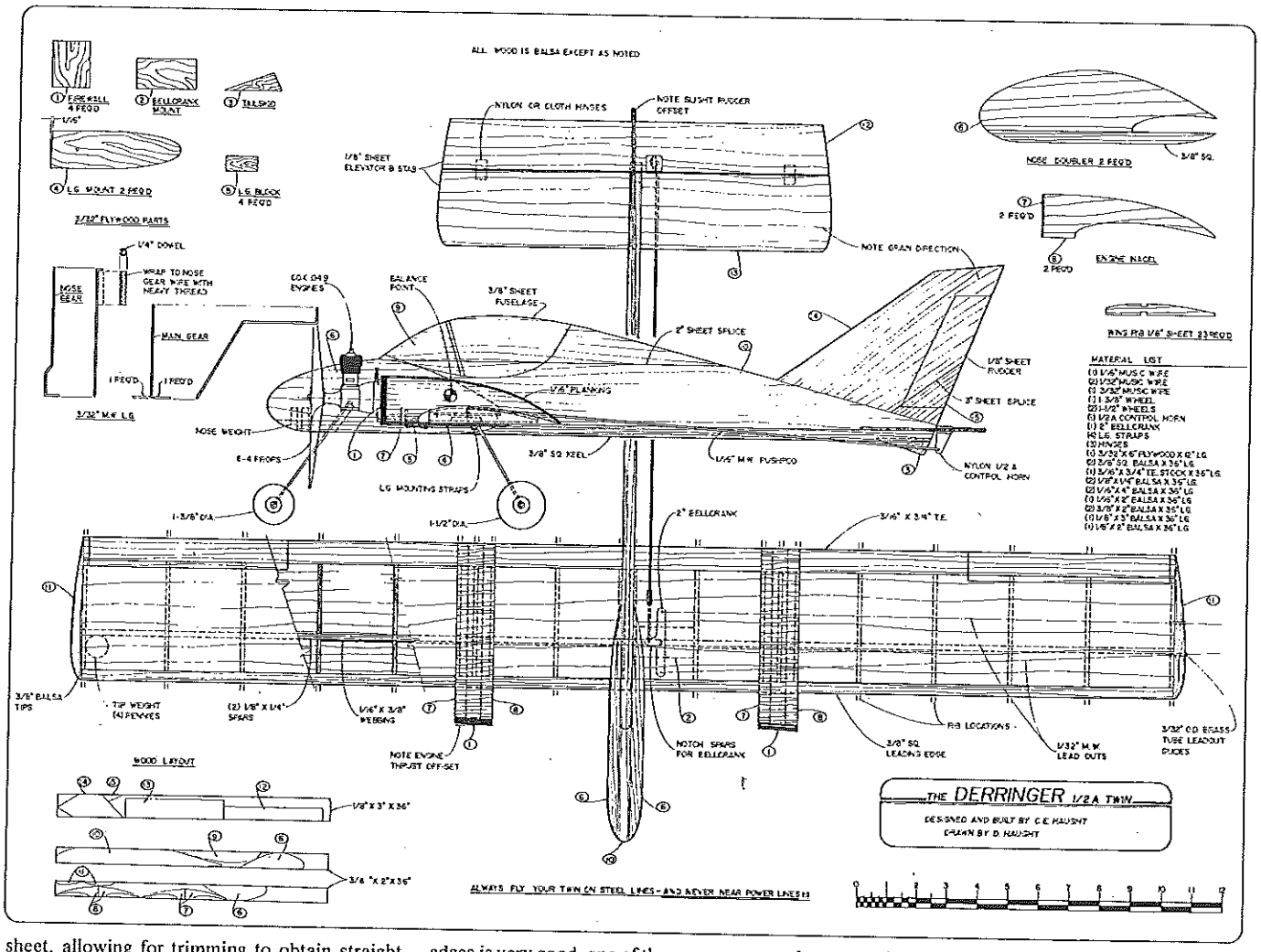


Nose doublers of ⅜-in. balsa add strength to fuselage-wing joint, and improve the model's appearance. Engine nacelles built-up to ensure a good glue bond, and to add rigidity, thereby reducing vibration.



Engines side-mounted only for the sake of appearance—improves side-view profile. Rotate tank to keep filler/vents and needle valve vertical—be sure fuel intake inside tank points to outside of circle.

FULL-SIZE PLANS AVAILABLE . . . SEE PAGE 132



sheet, allowing for trimming to obtain straight edges and compensating for the top sheet's slightly greater width requirement due to the airfoil curvature. If 4-in. sheet is unavailable, join narrower strips edge-to-edge. They will probably require truing up, using a straightedge.

One good way to join sheets is to tape them together on one side with masking tape while they are flat on the bench, then fold back to open up the joint while glue is applied. They are then laid on the bench, tape-side down, and held in place with weights until dry. If the fit of the sheet edges is very good, one of the new cyanoacrylate glues will speed things up. Remove tape when dry.

Tack the plan to your building board, and cover with plastic kitchen wrap. Study the plan carefully before beginning construction, as the wing internal details will be obscured during construction. Because of this, rib locations are shown outside of component outlines.

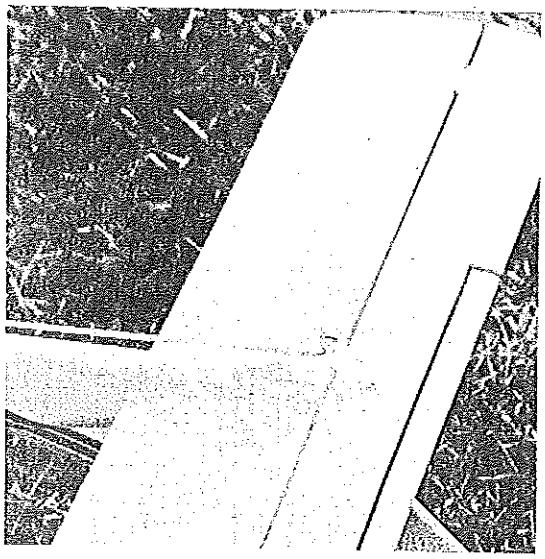
Pin the trimmed bottom wing sheet down over the plan, and glue in place the ⅜ sq. leading edge, 3/16 by ¾ tapered trailing-edge stock, and ⅛ by ¼ spars. Cut out 22 ribs from ⅛ sheet. Mark and drill ribs which have leadout wires running through them. Glue ribs in place. Add top spar and 1/16 vertical webbing between spars out to third rib from tip.

Bind and solder leadout wires to a 2-in. bellcrank, and bolt bellcrank to 3/32 plywood mount. Secure mounting nut with a drop of epoxy glue to prevent its loosening due to vibration. Install 1/16-in. music wire pushrod to bellcrank, and install complete assembly into wing—threading leadout wires through pre-drilled holes in ribs. Add ½-oz. weight (4 pennies) to outboard wing tip; glue securely

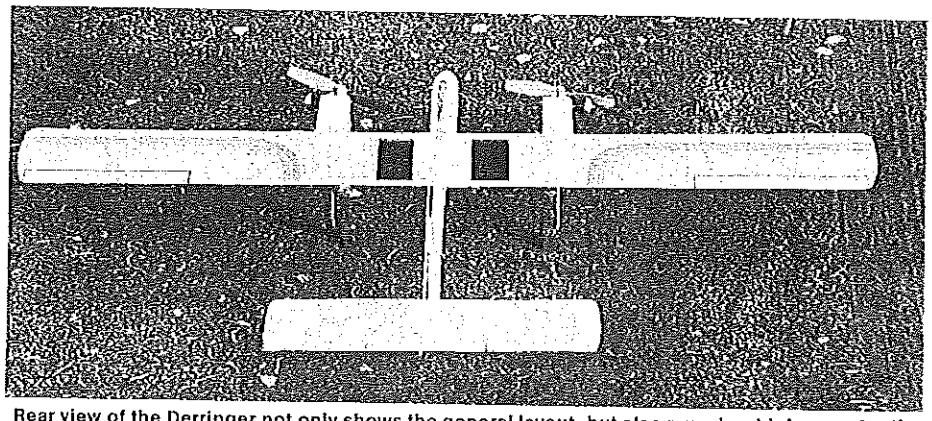
Carefully trim top sheeting to proper width; glue in place, securing with pins, weights, or rubberbands. An inch-thick stack of magazines works well. Make wing tips from scrap balsa. Drill leadout holes in left tip, and line with brass or nylon tubing. Glue in place. When completely dry, remove wing from board, and shape leading edges and wing tips. Sand thoroughly.

Rough-out two fuselage parts from ⅜ sheet,

Continued on page 121



Nylon control horn moves one-piece elevator. Soldered washer retains pushrod. For least control sensivity, pushrod goes in outer hole.



Rear view of the Derringer not only shows the general layout, but also reveals a high aspect-ratio wing. Model is constructed and aligned right over the plan. After removal, fuselage bottom and nacelles are capped, completing the structure. System assures accurate alignment.

about 3,000 rpm more than the ringed version that was seen at the Nationals. More than enough horsepower to compete with the now-dominant Fox .36.

John also mentioned the soon-to-be-released FAI .15 designed for FAI Combat. Competitive horsepower on lower nitro and ease of handling promise to make the engine very popular. If you're after every ounce of power, I'd recommend one of the Nelson .15s which will be available in June.

The Fox .36 appears to work better with the new venturi arrangement and liner shim. You shim the liner up for flying Fast Combat, and take the shim out for Slow, where you need more midrange punch for pulling heavier planes on suction. Naturally, you have to move the head to compensate. The new venturi also is an improvement, partly because of a better fit, and partly from having the spraybar moved outboard somewhat—it helps in keeping the engine from running over-lean at the end of the tank.

Tanks! Do I have a bunch of them! The last issue no more than hit the streets when I received a UPS shipment from Randy's Model Aeronautics, 515 Coleman Blvd., Mt. Pleasant, SC 29464. There must be a dozen different types of tanks for me to test. Randy's tanks are basically the familiar Don's tanks we all know. They're really well made, and some of them come with uniflow venting. All have good solder joints, and they even wash them out real well. My gas burner on the stove is just itching to get at one, since we're all through with the Regionals, and I can now get down to testing some of the samples people have sent. How about Craig Cervo's cheap alternative to commercial tanks—Carnation milk cans? Somebody sent me one sample that has more vents and pickup lines than I know what they're for . . . wait a minute, it's almost April 1st.

Charlie Johnson, 3716 Ingraham St., San Diego, CA 92109.

Derringer/Haught

Continued from page 54

and glue together at seam line. When dry, complete shaping. Wrap sandpaper over top of wing, and use wing as a sanding block to finish wing saddle in fuselage. This is best accomplished with wing secured to bench, and moving fuselage back and forth sideways over sandpaper. Fabricate engine nacelle sides and fuselage nose doublers in a similar manner. Cut out and shape stabilizer and elevators from ⅛ sheet. Elevators may be joined to stabilizer at this time, using three of your favorite hinges. Join and shape rudder parts.

Begin final assembly by pinning wing and stabilizer in place over plan. Glue fuselage in position, being sure it is perpendicular to the plan (check with a square or small triangle). Sand rear edges of fuselage doublers to shape, and glue in place. Install engine nacelle sides and 1/16 sheet over top. Be careful to not cover over any pins securing structure to the building board!

Glue rudder in place, offsetting the leading edge to the left (looking from the rear). Be sure it is vertical by checking with a square. Allow to dry thoroughly, and remove from building board.

Cut engine nacelle bottoms from 3/32 plywood. Note small blocks which receive landing gear wires. These may be solid hardwood or laminated scraps of plywood. All edges of nacelle bottoms should be beveled, except leading edge. Glue in place under wing and to nacelle sides. Install ⅜ square strip to fuselage bottom and doublers.

Note angle of firewalls, and sand nacelles to this angle. The inboard engine may be left

straight if desired, but the angle shown for the outboard engine is important to maintain line tension if the inboard engine quits first in flight. Firewalls are made by laminating two pieces of 3/32 plywood, or by using a single piece of ¼ plywood. Glue securely with epoxy.

Bend landing gear parts from 3/32-in. music wire. Bind nose gear wire to a piece of ⅜ in. dowel with heavy thread or fine wire. Drill hole in fuselage to accept nose gear. This is best accomplished with a piece if sharpened brass tubing—rather than a drill bit—to avoid accidental splitting or chipping. Coat assembly with epoxy glue, and push into place.

Give model a final sanding, and proceed with your favorite finish. I would suggest a traditional fuel-proof dope. Fill any imperfections with plastic balsa. Give complete model two coats of clear dope, sanding lightly after each coat. Apply a coat of commercial sanding sealer, or make your own by adding talcum powder to clear dope until it is the consistency of cream. Sand this coat almost completely away, leaving only filler in the wood grain. Add two more coats of clear. You should now have a good base for your color finish.

Brush or, preferably, spray on a couple coats of your basic color. (Dope sold in aerosol cans works great for a small model like this.) Let basic finish dry for a couple of days before adding trim.

Trim may be either painted on, using masking tape, or you may simply apply some of the new plastic trim tapes. When trimming with dope, I use a brush to avoid the necessity of masking the entire model. If you do paint on the trim, be sure to seal the edges of the masking tape with clear dope; this prevents paint from seeping under the tape and spoiling the job. I used striping tape for control surface outlines. A coat of paste wax will protect trim tapes.

The model is now ready for the final touches. Install main landing gear wires, securing with nylon straps and screws. Secure wheels with collars or soldered washers. Bolt a nylon control horn to the elevator, and hook up pushrod. Check control movement. Place control rod in one of the outer holes of the elevator horn to reduce control sensitivity. Form loops on leadout wires; bind with copper wire, and solder.

Attach engines to firewalls with # 3 x ½ metal screws. If engines are not mounted upright, remove tanks and place fuel feed lines toward outside of flight circle; reinstall tanks with filler tubes vertical. Install 6-in. propellers with 3-in. pitch. The original model was powered by Cox Baby Bee engines. Golden Bees work fine, and give longer flights. McCoy .049 engines should work equally well. Cox Black Widow engines would probably put out a little too much power.

Check balance point as shown on plan. Do not try to fly even a slightly tail-heavy airplane, as it will be very sensitive and difficult to control. A slightly nose-heavy model is safe to fly, but it will be sluggish. Add ballast, if necessary, to bring model in balance. Tail weight may be epoxied to the fuselage side under the stabilizer. Nose weight is best inserted into a hole in the nose doublers cut with a sharpened piece of brass tubing.

Flying your Derringer is much like flying any other model. There are a few precautions and differences you need to consider. First and foremost, never fly on anything but metal lines. Fabric lines as used for ½A sport flying will not hold a twin. Size .008-in. multistrand by 35-ft. is ideal.

Fuel and prime both engines before starting the

first engine. Use a fuel bulb (or some other system) to top-off both tanks while the engines are running—just before releasing the model.

Start inboard engine first, so that you will not be reaching over a running engine while starting the second one. Tune engines to just under their peak rpm. Be sure both engines are running in the right direction by checking breeze off the prop. Keep a rag handy to toss into the prop to stop the engines if the need arises.

A basic concern of multi-engine flight is the airplane's behavior with one dead engine. As long as line tension is maintained, single-engine performances will be satisfactory. If the outboard engine quits first, line tension is no problem. If the inboard engine quits first, the outboard engine will maintain line tension if it has the proper side-thrust as shown on the plans.

The speed/performance of the Derringer is directly related to engine-propeller combinations. If your model seems too fast, experiment with shorter-diameter or lesser-pitch propellers. Cox makes a nice three-blade prop which works well and looks great with their rubber spinner. This combination is nice with an electric starter, and the starter eliminates the problem of the engine running backwards.

Pick a calm day for test flights, and enter a new stage of aeromodeling!

FF Indoor/Tenny

Continued from page 58

not be too steady.

Photo 4 is a close-up of the adjustable support and the tail boom; the curved top of the support works well with both built-up and rolled tail booms. The height adjustment is a simple tissue socket and round peg, about twice the diameter we normally use on wing posts.

Photo 5 is a close-up of the parallel bar support construction. The wire post is anchored to the base by drilling a hole through the base, and using epoxy to tie the wire to the base and to the square reinforcement block. The base is 3/16-in. x 1½-in. balsa, and the vertical wire is 1/16-in. music wire.

Just above the base (in Photo 4) is the parallel bar. The bar itself is made from 1/16-in. x 1-in. balsa, and the black sliding tube is neoprene fuel tubing. The neoprene tubing is fastened to the bar with two pieces of wire which were bent to a "U" shape and pressed through the bar. These wires are then fastened to the bar on the back with dabs of epoxy. The wires can be pinched together somewhat with needlenose pliers to adjust how easly the bar slides on the wire post.

Model assembly. If we follow a certain procedure while assembling an Indoor model, it is possible to assure the best possible alignment of the finished model. The fixtures discussed above, or a similar setup, will work very well. For example, once the motor stick has been assembled (and braced, if desired), the next logical step is to attach the tail boom. Fasten the motor stick into the cradle as shown in Photo 3, and take special pains that the stick is rotated so the thrust bearing is exactly vertical. (If you use an offset bearing, which is not vertical with the model completely assembled, it is necessary to be sure the thrust bearing makes the proper angle with the vertical.)

Once the alignment of the motor stick is complete, mate the tail boom to the rear of the motor stick. (Presumably there will be some means to make the motor stick support the front of the boom, such as a balsa sleeve which reinforces the stick/boom junction.) Support the rear of the boom with the adjustable stand, and sight along the stick/boom combination from front to rear. If the boom is to be offset for turn, carefully adjust the stand's position until the correct angle is achieved. Some of us "eyeball" this adjustment, but it is better to measure the offset in reference to a straightedge, if possible.

No glue yet! Once the boom alignment is correct in the horizontal plane, measure the distance to the top of the boom at the front and rear of the boom. Most builders make the boom tilt up toward the rear so that the stabilizer has a small amount of negative incidence with respect to the centerline of the motor stick. This usually makes it easier to get the proper wing incidence during test flying, and results in having both wing