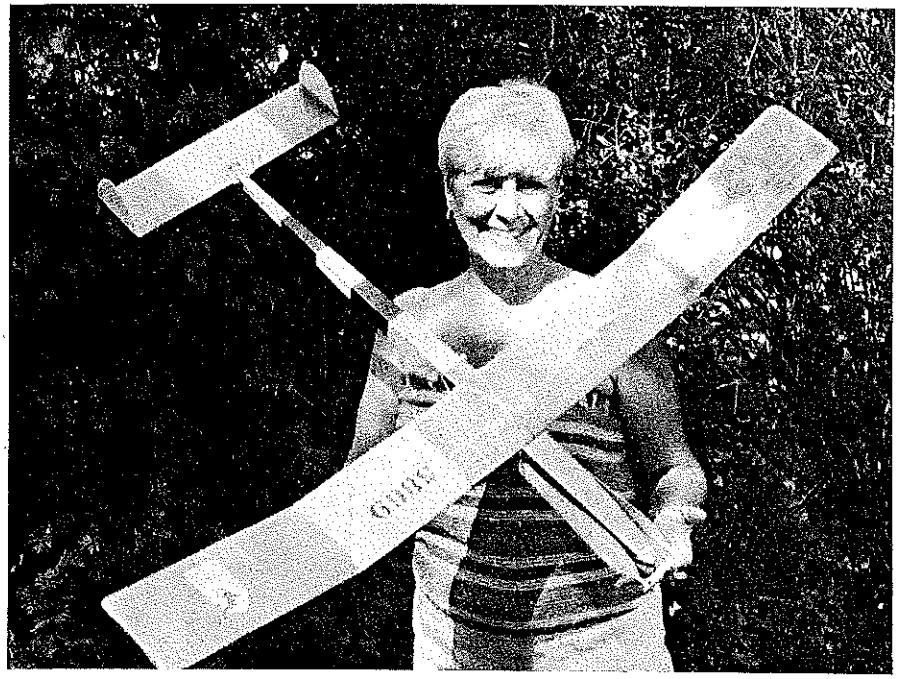
#531

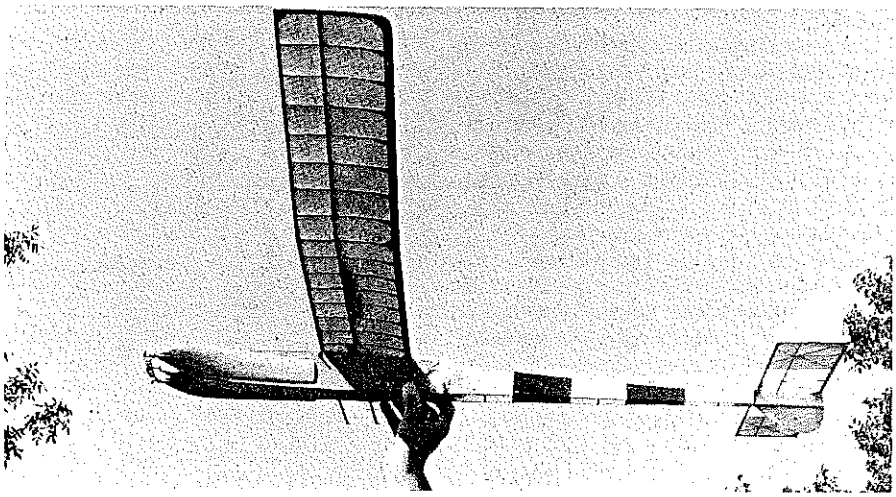
Terrible Coupe

With a four-year string of victories, this model has proven itself to be one of the best-ever designs in Coupe d'Hiver modeling.

■Chuck Markos



Above: Our author's lovely wife with his Terrible Coupe. Below: Bright sunlight shows off the internal structure in this winner of four successive Nats Championships, and it has just been named by the National Free Flight Society as the "Best Small Rubber Model" of 1986.

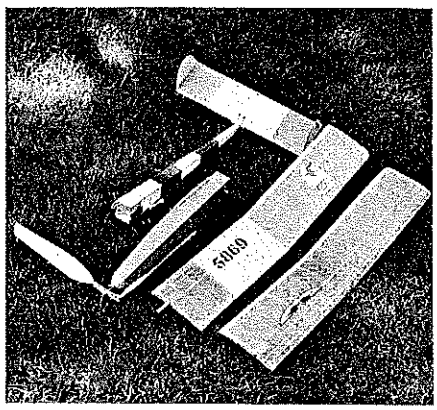


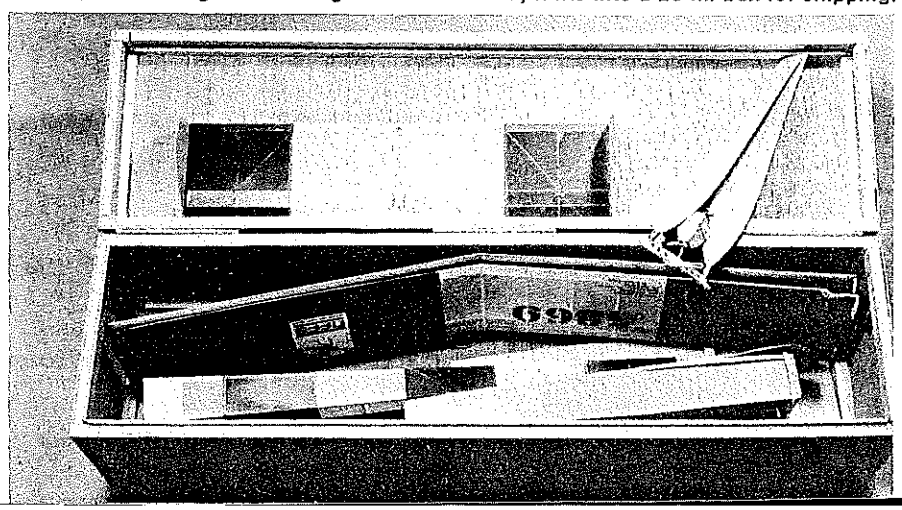
REGARDLESS of its name the Terrible Coupe is a very good model airplane. A visiting French modeler, seeing it fly, delightedly exclaimed *"Terrible!"* (the French way of saying "terrific"), and the name stuck. Coming from a Frenchman this was high praise, indeed, since Coupe d'Hiver has been described as a national passion to French Free Flighters.

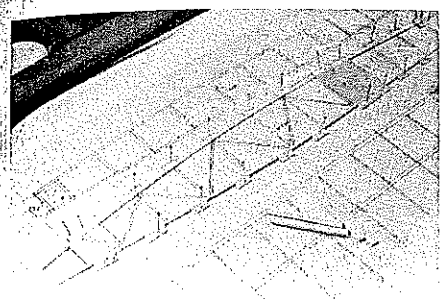
Please don't conjecture that I gave this model a name intended to discourage others from building it; it has been successful for me, but that tactic would be much too transparent—those interested in flying the Coupe d'Hiver class surely know already that this model has taken first place in its event at four consecutive Nats (1982-1985).

When the 70-gram Coupe d'Hiver rule was reinstated in the world outside of France, there was much discussion on the merit of the rule change. The modeling press indicated that the French considered two minutes to be less than challenging for a 70-gram Coupe. Others made vague references to "continental air" being different from the U.S. variety. The French Coupes were larger than the American ones and had big, slow-rpm props. In fact, prop runs were reported to have been in excess of two

Left: Break-apart construction makes it easy to transport this large model. Right: Disassembled, it fits into a 25-in. box for shipping.







Fuselage layout. Do not stick pins through the longerons! The scraps are left pinned in place to make both sides build identically.

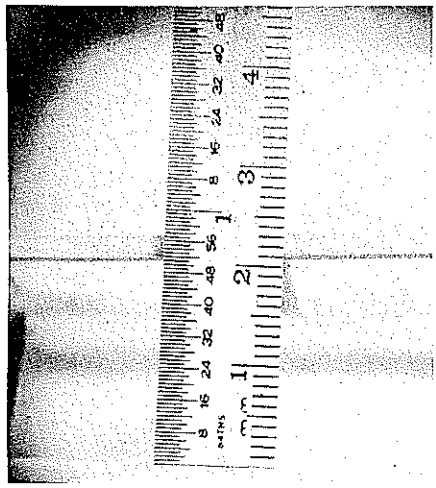
minutes for 100-gram models. I reasoned that a big Coupe built to the 1979 French style and kept to 70 grams would have no trouble with the 120-second max in still air. Naturally I expected to test the model against its European competition, so I incorporated a break-apart wing and fuselage for easier shipping.

The 70-gram model was not welcome at French competitions, but as luck would have it, the English were holding an annual Coupe d'Hiver Championship under *both* sets of rules.

My first try weighed 85 grams when built and required six additional grams of nose ballast. (So much for England and the 70-gram event.) Before I finally lost it in the woods at Westover AFB in 1983, the model weighed 95 grams and was twice the U.S. Coupe d'Hiver champion; but it was never recovered and never campaigned in France.

The second model weighed in at 72 grams ready-to-fly and took first-place honors at the Reno Nats in 1984. But soon after it, too, was lost when the stab dethermalizer (DT) failed during a local contest.

My present model weighs 75 grams and incorporates pop-off wing DTing as well as



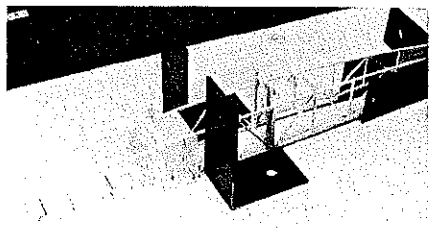
It is very important to measure and cut crosspieces accurately to avoid wavy longerons.

traditional stab DTing. Wing DT alone is sure to bring the model down but often causes the fuselage to descend vertically; DTing the stab as well alleviates the problem and reduces the likelihood of damage to the fragile front end.

Since 1980, these three models have executed 26 consecutive 120-second maxes in Nats competitions. Most were in still air before 10 a.m., but they've also proved themselves to be good wind and thermal fliers, taking home two wins from the "windy" Westover Nats. A *Coupe Terrible* indeed.

The following construction notes are based on the questions that modelers most often ask at contests. Additional comments are made on those features and techniques which are not standard to this type of modeling.

Propeller. The hub was fabricated from tempered aluminum using a drill press, a

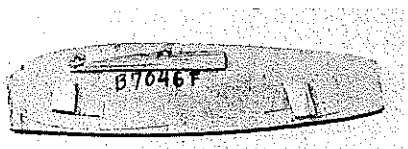


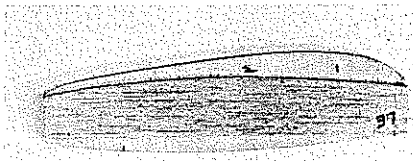
Fuselage construction detail. Use a temporary former, angle irons, and rubberbands to keep the parts square until the glue is dry.

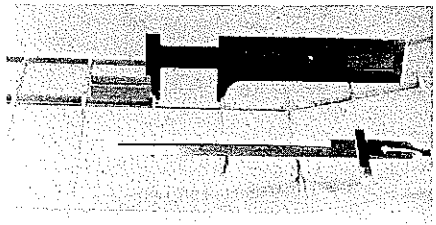
Dremel tool, assorted files, and a hack saw with a fine-toothed blade. It is not as difficult as it might first appear. Fit the brass tubing liners into the hinge and shaft holes with a vise. Make the tubing slightly overlong, and use the pressure from the vise to create a slight distortion in the liner, securing it in place. Bend the 1/32 music-wire hinges to accept 3/32 brass tubing. Flattening the wire slightly with a Dremel tool will result in a better fit with the tubing and make soldering easier. Wrap with copper wire, add flux, and solder with Sta-Brite silver solder.

To maintain 180° alignment while soldering, I placed lengths of 3/16 OD aluminum tubing in the brass sockets. Fine adjustment to the alignment was accomplished by either filing away part of the copper wire and solder or by adding .015 brass shims with solder and then filing. The best hubs are those in which the shaft and hinge holes are not exactly perpendicular and parallel. This puts a bias into the fold so that prop blades fit more snuggly against the fuselage. Similar hubs may be purchased from FAI Model Supply or from Jim Crockett Replicas.

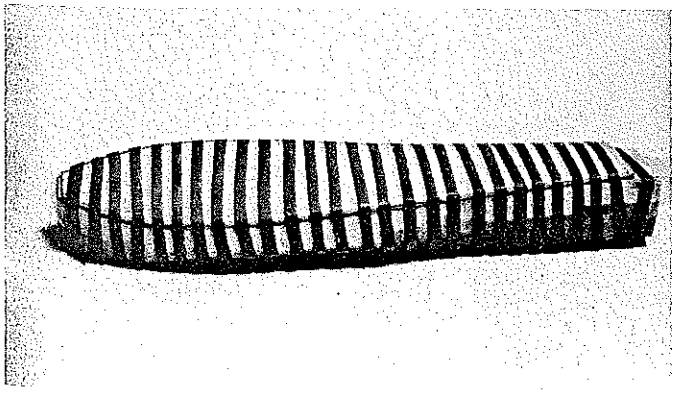
The form for the helical pitch prop can be carved from clear pine using the templates on the plans. The carving is quite easy if a

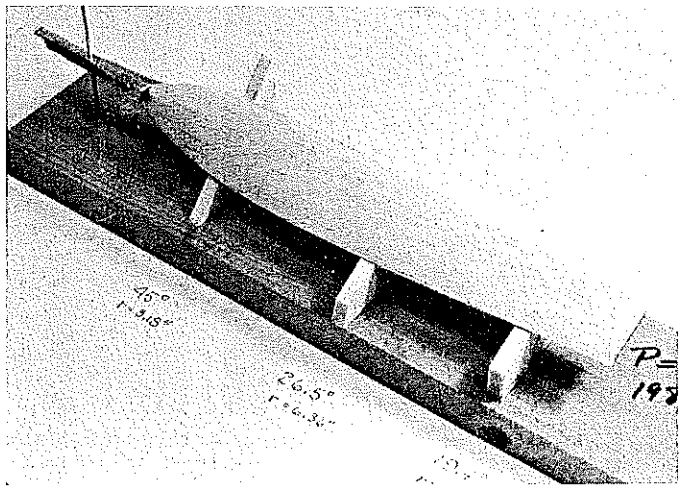




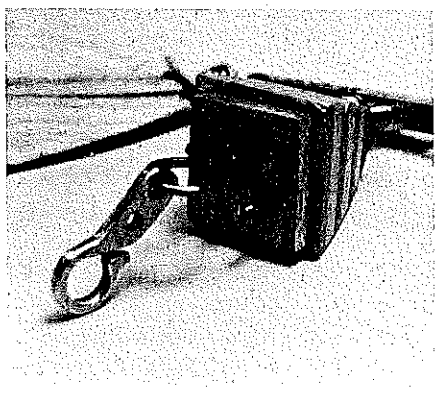


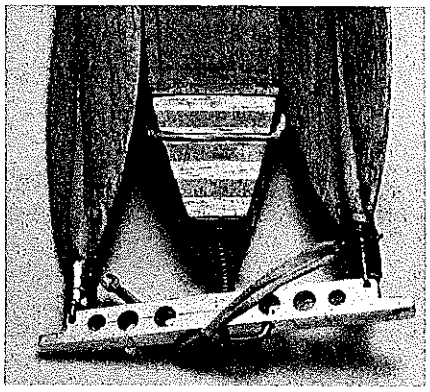
Left: The airfoil template that's cut from 1/16 plywood. Note how the grain runs (see text). Center: Note how the balsa undercamber pattern mates to the airfoil template cut in the 1/16 sheet. Right: The vertical-grain spar webs are in a balsa holder to keep them straight.



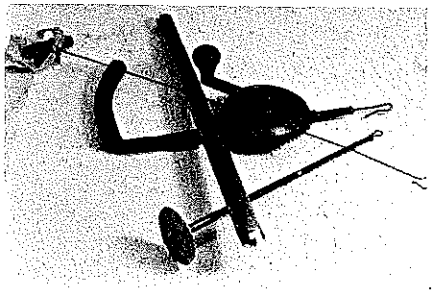


Above: A soon-to-be propeller blade sits rubberbanded to the laminating form just before it goes into the 200° oven. Right: The prop pitch jig. The perpendicular 1/16-in. wire and triangles assure that, when finished, both blades have exactly the same pitch.





Left: Nose block with dural winding hook. Screw sets the stop angle for the folding prop. Right: Hand-machined aluminum prop hub. (Text contains details for simple construction.)



Winding tools: Torque meter uses a 3/64 wire. Modified hand drill has 4:1 ratio. Winding tube protects fuselage from broken motor explosions. Long wire hook is used to transfer the dural S-hook to the propeller.

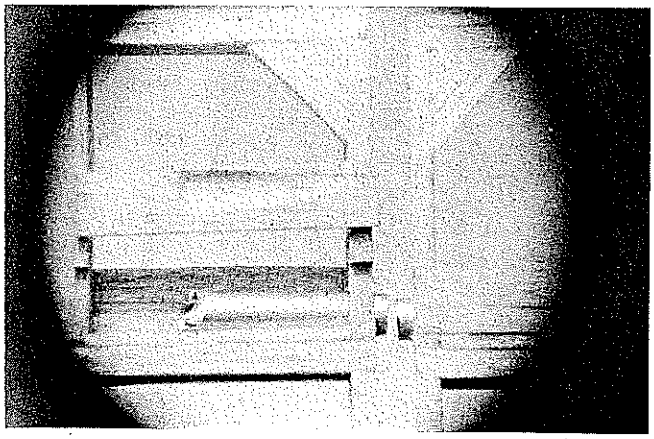
wood rasp is used for the coarse work. I left a small amount of camber in the form, though many Coupe d'Hiver fliers prefer a flat-bottomed section for their props.

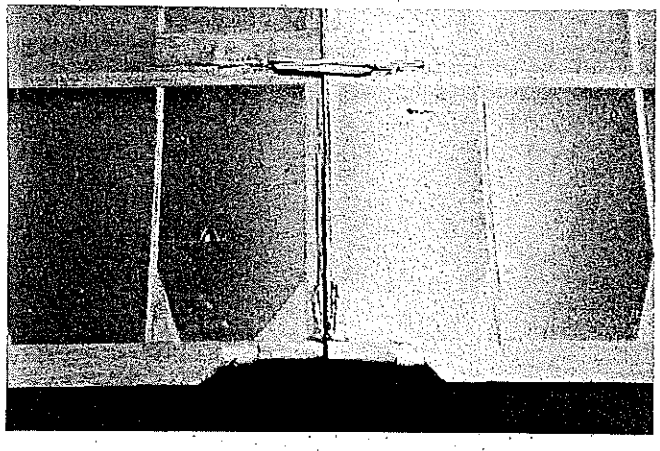
The blades are a laminate of 1/32 hard sheet balsa, .6-oz. glass cloth and epoxy, and 1/16 sheet balsa. Soak the balsa blanks in water, and lash them lightly to the form with rubberbands. Bake each blade pair in an oven set at 200° for a half hour. When cooled to room temperature remove from the form, and give the inside surface of each blank a very thin coat of slow-drying epoxy (I like Hobbypoxy Formula 1). Complete the sandwich with glass cloth, lash to the pitch form, and return to the 200° oven for 30 minutes. The heat will reduce the viscosity of the epoxy for a few seconds and allow it to penetrate the wood pores before it sets up. Protect the form with a layer of Saran Wrap or similar plastic wrap for this step, but make sure the oven temperature does not get above 200° or the plastic wrap will melt, gluing the prop blade to the form.

Finish the blades with sandpaper, and glue them in a 3/16 birch-dowel shaft with 5-min. epoxy. Use a jig as shown on the plans to set the pitch of each blade. When correct, glue the prop shaft into the brass socket with cyanoacrylate (CyA). Drill a 1/32 hole through the socket and shaft, and insert the hooks for the rubberband that folds the prop.

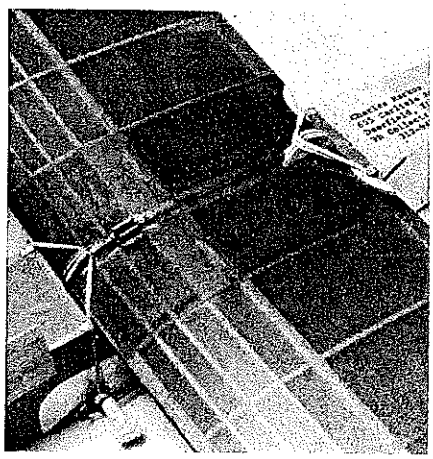
Wing. Several building aids were used to make wing construction easier and ensure fidelity to the plan. The plywood rib template guides a single-edged razor blade along the airfoil and assures uniform ribs with no need to draw lines on the balsa sheet. Make sure the exposed grain of the plywood is perpendicular to the chord axis. Though it is harder to prepare the template in this manner, the orientation keeps the razor blade from cutting into the template.

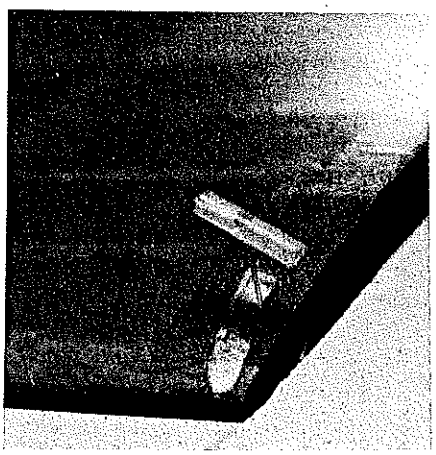
The first cut is the undercamber. Match



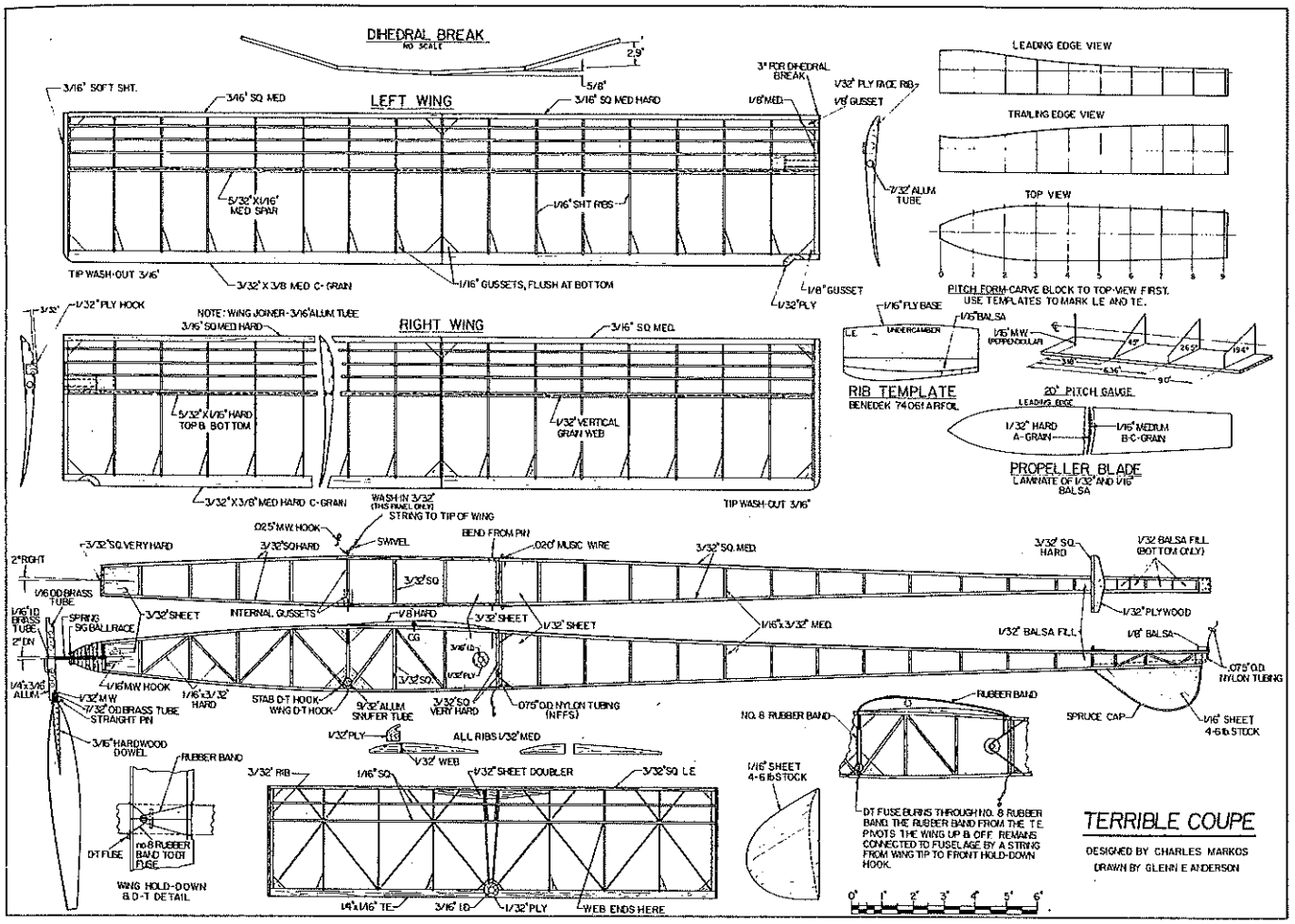


Left: The aluminum wing joiner tube as seen from the bottom. Block the wing up at the correct dihedral on the workbench, then glue the aluminum tube into place packed with scrap. When dry the tube is sawn in half. Another piece of tubing with outside diameter matching the larger inside diameter joins the halves. Right: A rubberband at the center keeps the two panels pulled together. It is not necessary to incorporate guide pins in the wing halves to hold them in alignment as this is accomplished when the wing is strapped to the fuselage.





Left: The dual release DT fuse. Band to stab is a piece cut from a balloon to make it burn through first. Middle: The DT setup for the rear-pivot wing. Note how the rubberband hook is raised 3/8 in. above the surface to increase leverage. Right: The wing tip line hold. When the wing DTs it comes completely off the fuselage; a string from one wing tip to the fuselage keeps the two pieces from being separated during descent.



the undercamber cut, and slice off the top camber. Make sure the ribs are at least ⅛-in. longer than required and also 1/32 deeper at the TE than the section requires. It is much easier to remove excess than to add onto a rib that is too small.

Hot-wire-cut a sanding block from Styrofoam to match the wing undercamber; then affix #100-grit aluminum oxide paper with latex contact cement, and use it to shape the ribs. A second Styrofoam block was also cut to help align the ribs for cutting the notches. Sandpaper "notch cutters" were prepared by gluing #100-grit paper to hard balsa at the widths required for the notches.

Check the stiffness and/or weight of all the un-notched ribs. Place the lighter ones at the extremities and the heavier ones toward the center. It helps to order the ribs by writing a number on each one before stacking and cutting the notches. If this isn't done, a rib may be placed out of order and will divert the notch from parallel, resulting in unsightly, wavy spars and unwanted warps. Stack the numbered ribs on the Styrofoam form, and cut the notches. I use a balsa stop on the notch cutter set to a 1/16-in. depth. When all notches are cut, hold the stack together with strip balsa placed in the notches, and square off the LE portion of the ribs. Drill pilot holes in the center two ribs to accept the wing joiner sleeve.

The notched TE is packed up at a 10° angle and the ribs trimmed and glued to the TE and LE. No spars yet! Make all the dihedral joints, then add the lower 3/32 x 1/16 spar. Place 1/32 sheet balsa webs with the grain aligned vertically between the ribs. Use the notch cutter to carefully set the depth.

For the wing joiner set a length of 7/32 OD aluminum tubing into the pilot holes, and adjust the dihedral to ⅜-in. for each center section. Glue the tube in place, and pack with scrap balsa to form a box. Cut the tube and slip the 1/32 plywood cap ribs on.

The gussets at the TE deserve special

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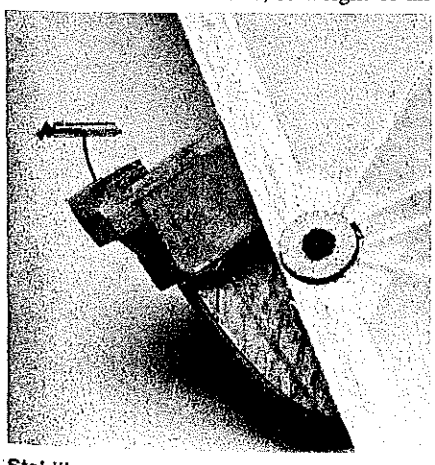
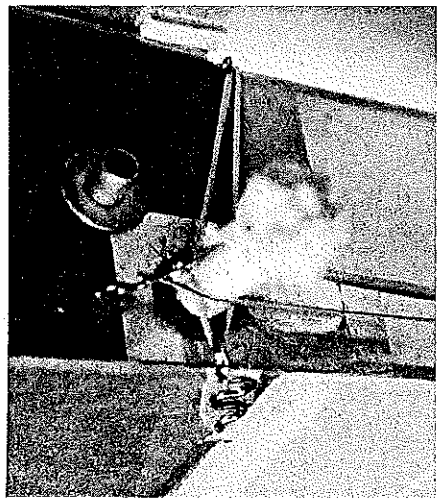
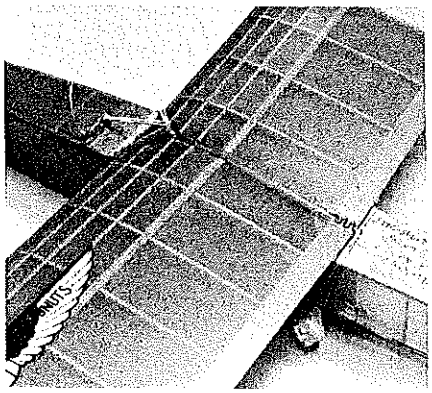


Stabilizer rear hold-down uses nylon tubing. Spruce cap is to strengthen the sub-rudder.





Left: Alternate dual-release DT setup with one-piece wing and leading edge pivot. Right: A rubberband helper is used to swing the wing away from the fuselage. Using a pop-off wing may seem drastic, but normal stab DTing is often not enough when in a strong thermal.

had to add an additional rudder to the fuselage to get the turn he wanted, but once adjusted the plane flew exceptionally well as evidenced by the flight time. NFFS (National Free Flight Society) guru Tony Italiano was second in POP with a 9:33, followed by Vito Gagliano's 8:50. Dad Gagliano may want to check with son Charles for some tips on flying the event. David Brown was the lone Junior entrant and posted a time of 3:24.

The most positive spinoff of what was essentially a lackluster Indoor contest was the presence of a TV film crew from *National Geographic* which captured some representative samples of Indoor flight on film. The crew erected a large black velveteen backdrop and then filmed several models in flight as they repeatedly passed majestically in front of the blacked-out set. The visual effect for those of us watching the laborious process was stunning. Lit from the front and sides, the microfilm ships of Tony Becker and Richard Doig scattered flashes of rainbow colors with each turn of the prop and each new angle of climb or turn.

Scheduled for airing in late fall (possibly October or November) on *National Geographic's* "Explorer" program, the segment is now tentatively titled "Flying Fanatics," which may very aptly describe those of us who attended this year's Indoor Nats at Lake Charles.

Baby Bird/Dixon

Continued from page 73

Trimming and flying. Follow the engine manufacturer's instructions, and get familiar with operating the engine on the test stand. Once it is installed in the model, tune it so maximum power is developed when the nose of the model is pointed straight up. This will result in a slightly richer setting in level flight. If the engine is overcompressed slightly, the run will be steadier than if undercompressed as all the fuel will burn, and it won't have a flameout as easily.

Once the engine is properly broken in, you will seldom need to touch the compression screw. I find that quicker starts are possible by opening the needle valve exactly a half-turn from the flight setting and then closing it over five seconds or so as the engine warms up. No priming is needed. I generally start the engine with the model upright, choking it with my finger for two or three flips. Usually another two or three flips is all it takes to get it running.

Line length is 40 ft.—using Sig .008 cable lines cut down from a 52-ft. package. At this length, I needed exactly 1 oz. of tip weight on my model. *Do not try to fly this model with typical Dacron ½A lines!* I use a Perfect ½A handle (modified with a coat hanger wire line carrier à la Rich Porter so line spacing can be adjusted). I've settled on a spacing of 3 in.

The propeller shown in the photos is a fiberglass Bolly designed originally for Goodyear or FAI Team Racing. It has 6.8 in. diameter and 4.9 in. pitch. I've also had good success with a Graupner nylon/glass 7 x 5. Believe me these *are* the right sizes for the P.A.W. .049. I suspect a Tee Dee would use a 6 x 3 or 5½ x 4 prop.

Lap speed on this and other ½A models will be faster than you may be accustomed to (Reynolds number effect again), but this should pose no problem.

Fuel. I use Aero-Dyne diesel fuel right out of the can. Our local hobby shop is run by a Free Flight and Old-Timer enthusiast who stocks this sort of thing. If you are not so fortunate, mix your own per instructions in the engine manual. I, myself, have not tried the Davis Diesel fuel, but it should work fine if it has sufficient castor oil for lubrication. P.A.W. recommends running *only* castor, and I agree based on much experience with lapped, plain-bearing glow engines.

Manufactured diesel fuel appears expensive, but you use only ¾ oz. per flight. Its ether content makes it highly evaporative, so it's best to buy it in pint or half-pint quantities. Likewise, if you mix your own, keep the quantities small. You will also need to switch to neoprene fuel lines, as the diesel fuel will cause silicone lines to swell and slip off the fittings.

Hope you enjoy the Baby Bird. Any questions or comments can be addressed to me in care of the magazine. Fly safely.

Terrible Coupe/Markos

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mention. Pay attention to the wood grain. Each gusset needs to be hand fitted for a perfect match to the TE. Final sanding of

the wing uses the undercamber sanding block clamped in a vise. Scrub the wing on the block with short strokes to remove any uneven construction.

Covering and finishing. Give the framework two coats of dope wherever it will come in contact with the covering. Use nitrate dope if you have it, otherwise use Sig Lite Coat butyrate. Japanese tissue is available from Peck-Polymers or from Old-Timers Model Supply in a variety of colors. If you are inspired to build a competition Free Flight model, you should already know that tissue has a grain direction. Cover the bottom camber of the wing first by laying the tissue with the grain spanwise and brushing thinner through the tissue—first at the spar, then at the ribs. Rub lightly with your finger to push the tissue into close contact with the framework while the dope is still soft. Do the perimeter framework next by the same method. Trim excess tissue flush to the TE with a sharp razor blade, but leave approximately 1/16 at the leading edge to curl around to the top side. Seal all edges with dope using a fine brush. To keep the covering from pulling away from the undercamber after shrinking and doping, give the junctures of the ribs and tissue a coat of dope before covering the top camber.

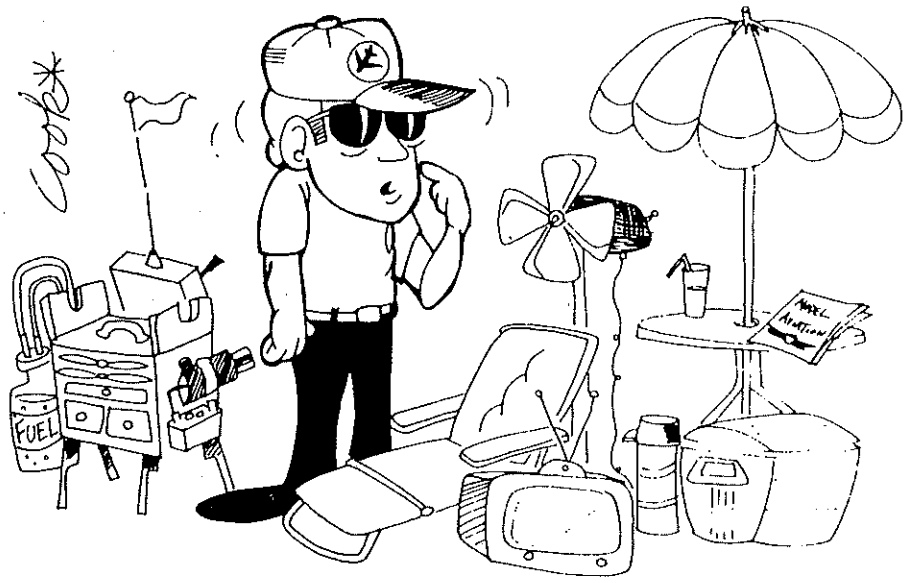
The fuselage is covered with two layers of tissue cross-grained at a 45° angle to the axis of the motor box (front portion). Do not attempt to apply the tissue with biased grain to the tail boom, or severe warping will occur!

The covering was water-sprayed and shrunk, then given two coats of thinned dope. A super-light model requires spray doping. Only three grams of weight was added in finishing this model.

Flying. Several checks need to be made before heading out for the first flight. The wing should have a slight washin of the inner right panel, and both outer panels should be washed out. The center of gravity (CG) with a 10-gram motor in place should be as indicated on the plans. Align the trifins dead straight ahead. One way to check this alignment is to establish perpendicular reference lines on a tiled floor. Down and right thrust should be built in according to the plans.

Test-glide the model to obtain a smooth right-hand turn using up to 3/8-in. stabilizer tilt, sub-rudder adjustment, and stabilizer incidence in that order.

Always wind with the winding tube in place to protect the fuselage from exploding motors. Top performance means maximum turns and lots of Pirelli (if you have any) motors blown. I have flown this model with eight strands of 1981 4mm Pirelli, six strands of 1979 6mm Pirelli, and 10 strands of 1981 1/8-in. FAI Supply rubber. At 70-75 grams, you can exceed two-minute dead-air times with any of these motors, but my best combination was eight strands of 4mm Pirelli wound to a torque of 1,500 gram-centimeters and up to 520 turns. I never got



I knew I forgot something . . . MY PLANE!

more than three flights from a motor used in contest flying.

The first powered flight should be wound to approximately one-third maximum turns. The climb should be to the right; adjust with thrust changes. A stalling climb should be corrected by downthrust or more right thrust before adding more turns. Fine adjustments will become necessary as more power is added and as flying conditions change. Once, when testing the model at the Reno Nats, I knocked the tail boom from right-hand to left adjustment on launching with full power. The model flew perfectly to the left and even thermaled left in the glide. A big, slow-moving model like this one is not as susceptible to trim changes as the smaller, faster models are. It is very easy to adjust and forgiving of mistakes.

The DT arrangement of hooks and rubberbands has been worked over since the plans were drawn. The objective was a more positive action with a less complicated setup. Four methods were investigated, and the two most successful ones are illustrated in the photos. Both work like a stab DT without a limit string. The one I like best pivots on the wing LE and requires a LE mount similar to a stab DT. It was used on a one-piece wing. The other method is a TE pivot. This requires rounding and reinforcing the TE and using a hook to hold the rubberband at least ⅜-in. above the wing for enough leverage to make the wing pivot from the fuselage. The two sets of dual hooks help hold the two-piece wing together while in flight.

Questions or comments? Send a S.A.S.E. to Chuck Markos, 655 Carlisle Ave., Deerfield, IL 60015.

Wakefield/Oldenkamp

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30% of the wing. This formula yielded stubby, somewhat fragile airplanes, most of which had rather spindly undercarts of bamboo bits, and huge fins and props. Suitably trimmed, however, and with "modern" rubber strip, they are outstanding performers. The ROG feature makes things very interesting (especially if done improperly) to say the least. Few of us admit it, but ROG is something we miss a lot; Old-