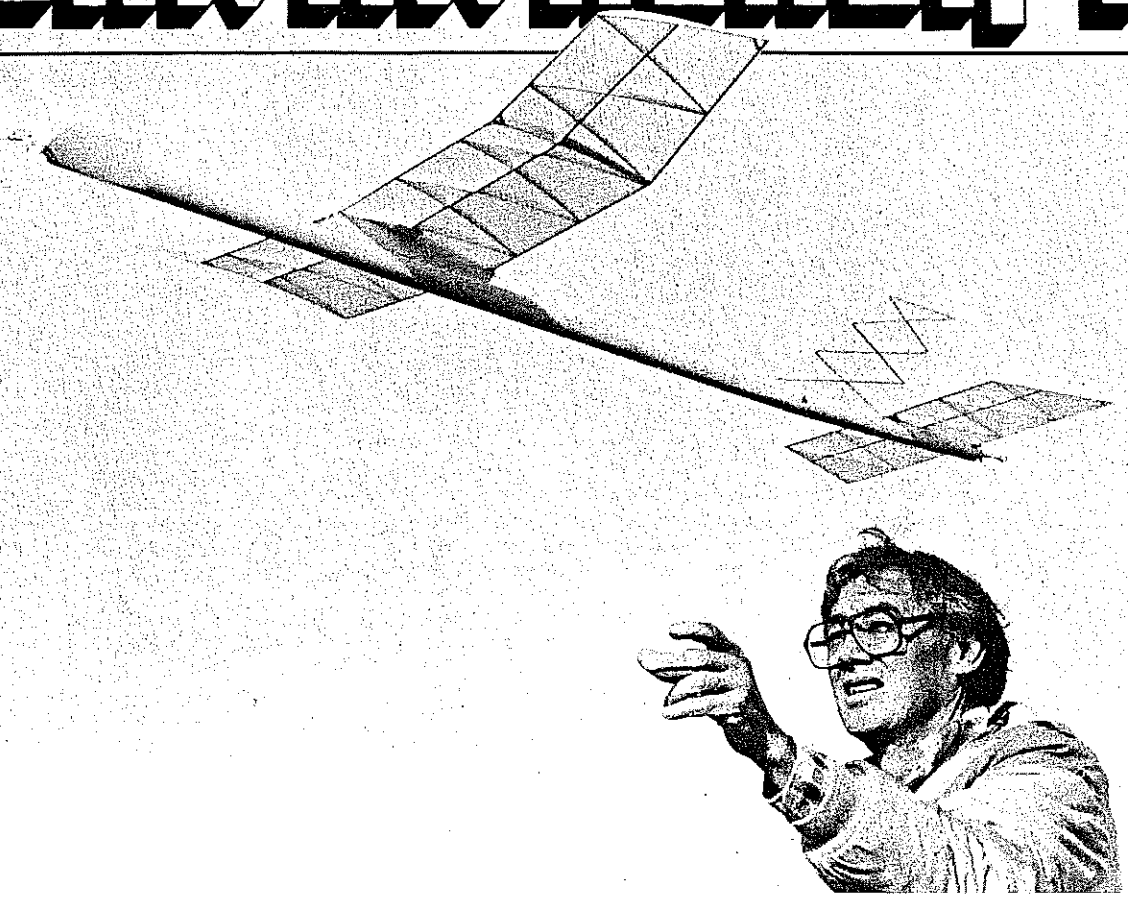
#523

DAWNWALKER III



The moment of truth: prototype builder Bob Langdon a few milliseconds into the maiden flight of Dawnwalker III. With the rubber wound only 400 turns and with the winds less than ideal, the model clocked an absolutely magnificent 3:30. The prop leading edge profile is clearly flaring under the power burst for most efficient power utilization. The no-frills, lightweight approach to the model is also very evident.

THERE IS NOTHING NEW under the sun! True. In the late Sixties, George Perryman was flying a 2½-oz. Unlimited Rubber (subsequently renamed Mulvihill) ship that featured a 5-min. motor run, fixed prop for dethermalizing, and condenser paper covering. On the Zaic three-view drawing, notes pointed to a heavier, "regular" version that obviously would survive better in competition. Since that time, of course, there have been changes both in the AMA FF Rubber events and the emerging "special" contests that, I suspect, will eventually find their place into the rule book.

The most intriguing of them is what I once named "Meuser Marvelous Mulvihill" after the innovative founder, Robert B. Meuser, well known columnist/author/designer, whose aim was to probe ultimate Mulvihill performance through an early-morning (dawn), one-shot, winner-take-all contest. His then and now rules were simple but foxy (in order to eliminate the occasional Pennyplane or F1D entry): regular AMA Mulvihill rules apply, *plus* the model must have double-covered surfaces, enclosed motor, *and* the airplane itself must weigh a minimum of *30 grams,* or model *and* rubber motor must weigh *no less than 60 grams.* Very challenging.

A number of such competitions have been staged over the past seven years or so, notably at the U.S. FF Championships in Taft. Robert P. White, the Great Grand Gumbandito of them all, has pretty much dominated the event with remarkable times averaging 11 min. or so, with a high of 14+ min. His airplane, an 80-gram version of his renowned Twin Fin, represents the current state of the art, and we have great respect for it. We thought it worthwhile to broach an alternate.

While at the 1984 Reno Nats, several of our San Diego Orbiteer crowd hunkered down over casino food and sort of dared each other to attempt an indoor/outdoor-type Mulvihill that might *eventually* prove to be a viable contender in the Dawn Flight events. To date, four of us (Charlie Yost, Robert Langdon, Don McHugh, and the author) have built and flown eight pretenders to the task with varying degrees of success. Weights have run from 50 to 80 grams. Fragility factor: zero to passable.

Langdon recorded a high time of 15 min., 40 sec. at our Otay Mesa test field (and

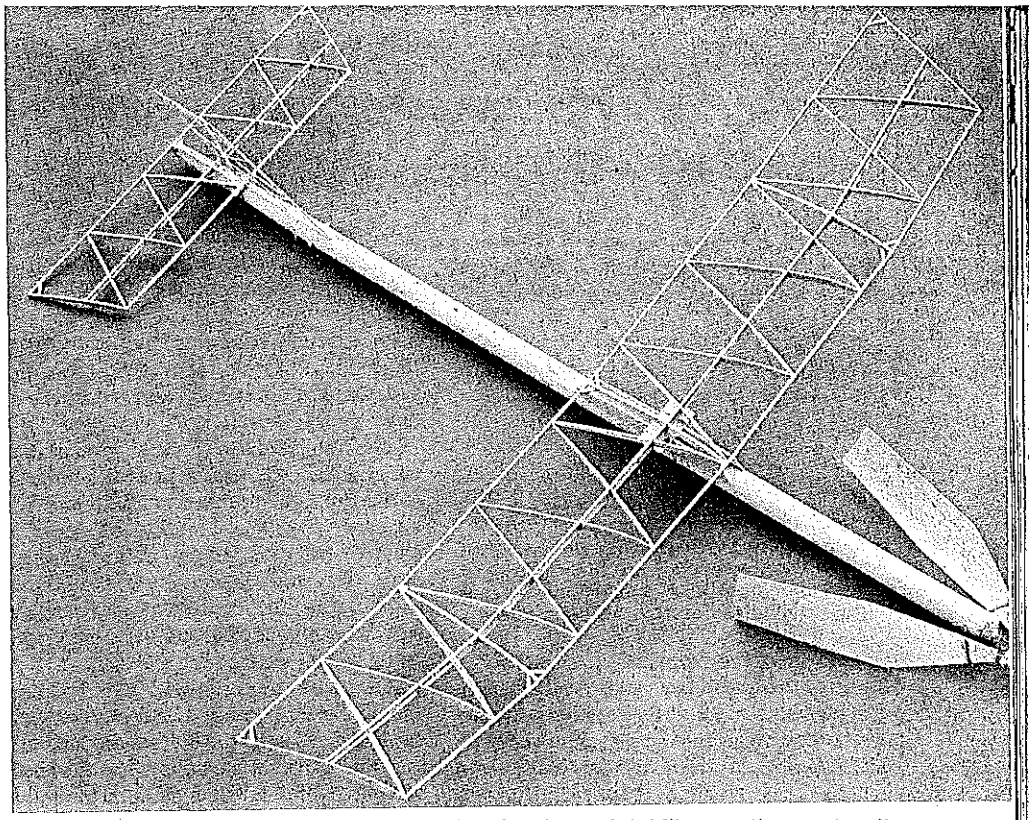
While not intended to withstand the rigors of midday competition, this unlimited-type Mulvihill model designed for early morning calm air has butterfly-like speed and an almost mesmerizing grace to stretch near-nothing lift to unbelievable flight duration. ■John Oldenkamp

went across the Mexican border to retrieve it) and has had the best results. I had a prop run of 8:40 on the Dawnwalker prototype but snapped a wing on dethermalizing. Air loads collapsed McHugh's new creation at about 1:30.

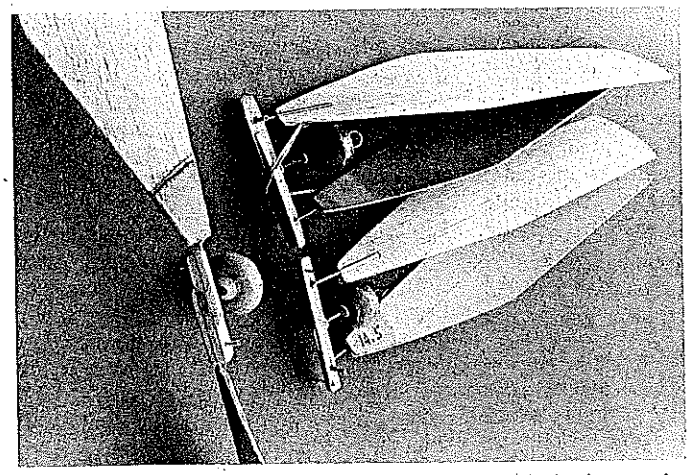
This was and is an experiment. The unknowns have become public only through pragmatism, but they have been extremely delightful to deal with as work on the project progressed. We are still experimenting.

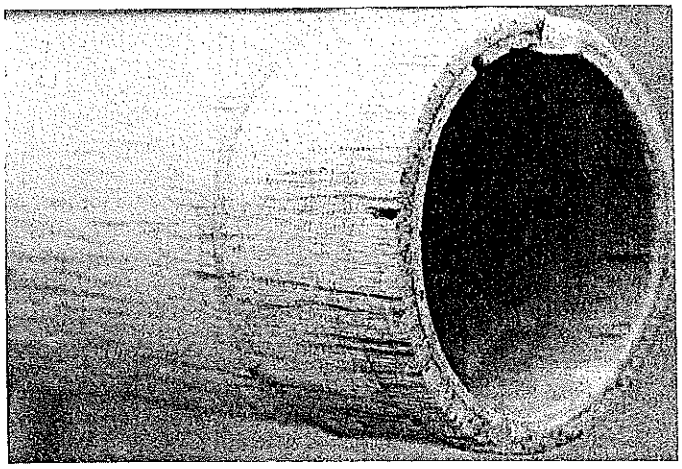
The model presented here could be the starting point for an aspiring Mulvihill flier. It is, in my view, a very safe design that rewards the builder with uncommon pleasure. Dawnwalker I, in fact, captured first place in its first outing in a regular Mulvi event—with no help from the pilot, who sent it off with the downthrust shim omitted for the first flight.

It is absolutely majestic in flight. Given light or non-thermal conditions, it will butterfly along at approximately 150 rpm through a prop run of 5 to 8 min., depending on trim and air density, settling into a heart-stoppingly slow glide after the prop folds. In many ways it is clearly a retrograde model, acting like and doing things one really shouldn't these days of hightechery!

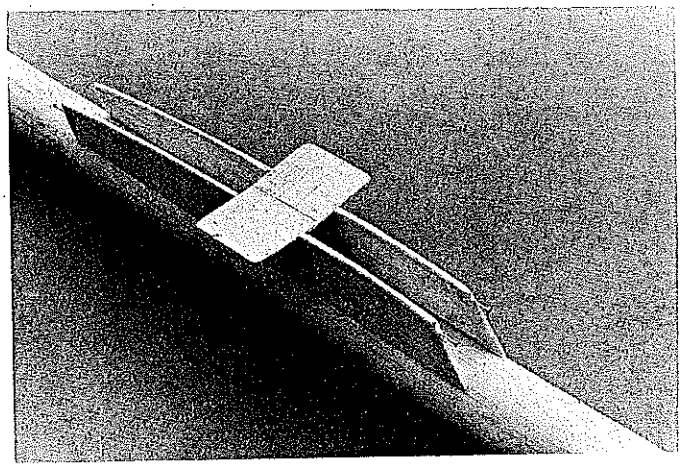


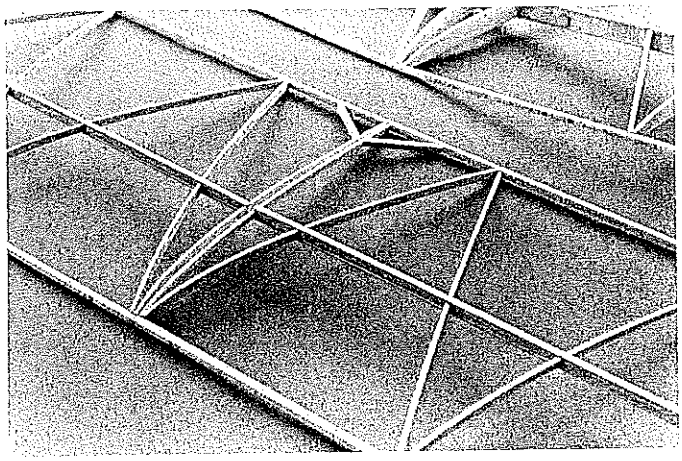
Langdon added the extra "semi-webbing" to the wing tips and stabilizer section—not really necessary, but it greatly improves strength. Air loads alone will keep the prop folded.



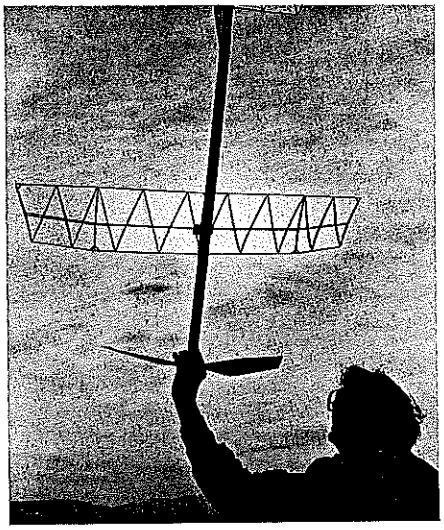


Left: The heart of the matter. A big, thin, highly-pitched prop gives the Dawnwalker series its punch. Easy to make from sheet balsa and thinned white glue, the props are "can-formed" and have solderless hubs. Foreground version is for a model III, while the background versions are earlier sets. Rubberbands on earlier versions to assist folding proved unneeeded. Right: Front end of the motor tube is reinforced with strapping tape on the outside. Also note the notch for the winding bar. The tube, platforms, and DT hardware weighed 17.6 grams total.





Left: Wing mounting system is strong and lightweight. Will not let the motor tube distort as winds are piled up. Straight-grain pylon sides may make some nervous, but they work fine. Add vertical pieces for strength if you like. Right: Alternate sliced-rib wing construction for those who want the ultimate slow flier. Prototype wing in background used 36-in. lengths of leading edge stock and weighed 1.3 grams.



Looking through the super translucent "Sky-wrap" covering shows off the functional design and excellent proportions of this highly-specialized model. All pics: author.

Our discovery process has answered some of the questions, but not all of them. Lightweights need to fly slowly, but once upset they invariably go into a power stall, speed up, and dash to the earth with discouraging results. They are tricky in ground turbulence. They seem to need an inordinate amount of power-robbing downthrust to cure the foregoing. However, given "light" air, their performance is absolutely and astoundingly magnificent. I do not think you will be disappointed if you try one.

Construction. Target weight of the finished model, less rubber motor, is 55 grams. Selection of materials is very important as is thoughtful use of glue. Properly done, you will hit the mark and end up with an attractive and reasonably robust machine.

Weigh everything ahead of time on a good triple beam balance scale, and discard any parts that are grossly overweight. As guidelines, balsa sheet weights were about as follows: motor tube blank, 3.45 x 36 in., 9.5 grams; rib sheet stock, 3 x 36 in., B-grain, 12 grams; wing leading edge (LE) and trailing edge (TE) stock, 3/32 x 1/8 in., 1.5 grams; etc. Some 6-lb. stock is actually *stronger* than 10 or 12-lb. stock depending on the grain makeup.

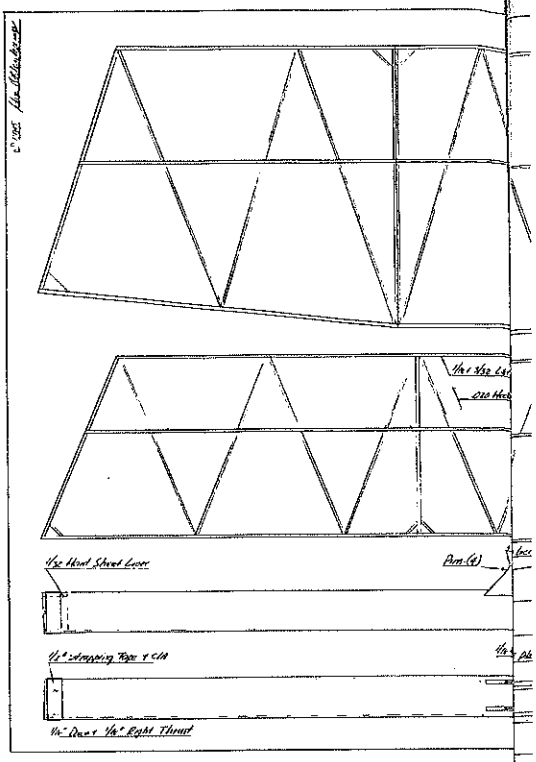
Propeller. You might want to start with this unit, since it is somewhat different from the norm. The blade outlines should be cut, then laid up with thinned white glue on a form similar to the plan. No need to soak the blades. Merely tape them in position, separated by wax paper, and set aside a few days to dry.

The hub is a little block of spruce that is cut and drilled to size, relieved for the shaft at the front, then rubbed out with Hot Stuff for hardening. The prop folder "stops" are glued on *after* installation of the "hangers" as a last step. The photos should help explain this. Suffice to say that this solderless hub unit comes out very light while being strong enough for the task.

After the prop blades are dry, they should be edge-sanded and covered with dope and tissue on the bottom only. A cut is then made to inlet the tubing that carries the hangers, which are then glued in place with cyanoacrylate (CyA). The plywood cheeks are then put in place. Form the hangers, simple wire "Ls," and test-fit them to the tubing inlets. Set one blade in the pitch jig at the proper orientation, then tape the hanger down at 90° to the thrust line. A gob of 5-min. epoxy will hold it all together.

Once both blades are done, they are mounted on the hub and kept in place with short lengths of tubing glued to the outer ends of the hangers. If all is well, you should have a prop unit of nominal 23 in. diameter by 30 in. pitch. With hub, spring, and washers, the target weight is 12 to 14 grams.

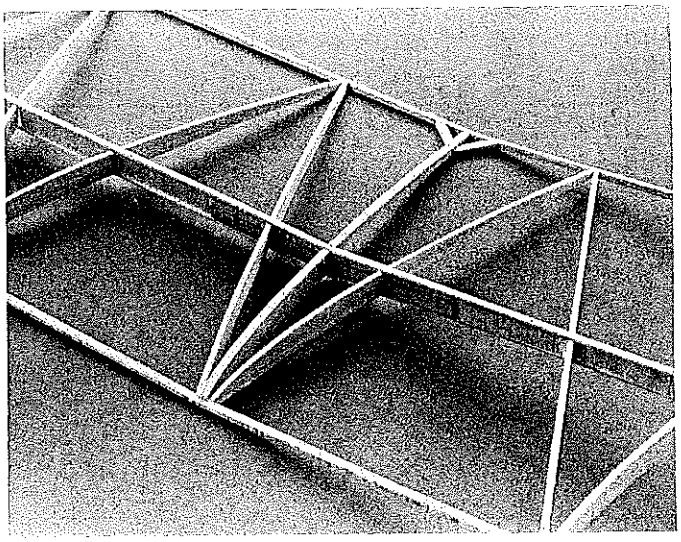
Stabilizer/fin. Build these next. Use the wood sizes shown on the plan, and try to go easy on the CyA glue. Try to avoid placing "stress" on any of the parts, helping to prevent unnecessary warping.

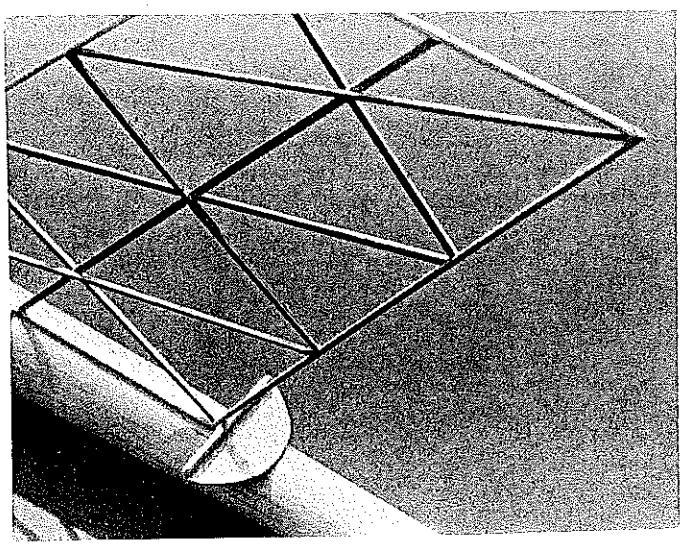


The fin has an internal basswood spar that gets installed off the plan after all the diagonals are in place. The stabilizer has light ribs, *external* basswood spars, and vertical webbing. Do not leave it out!

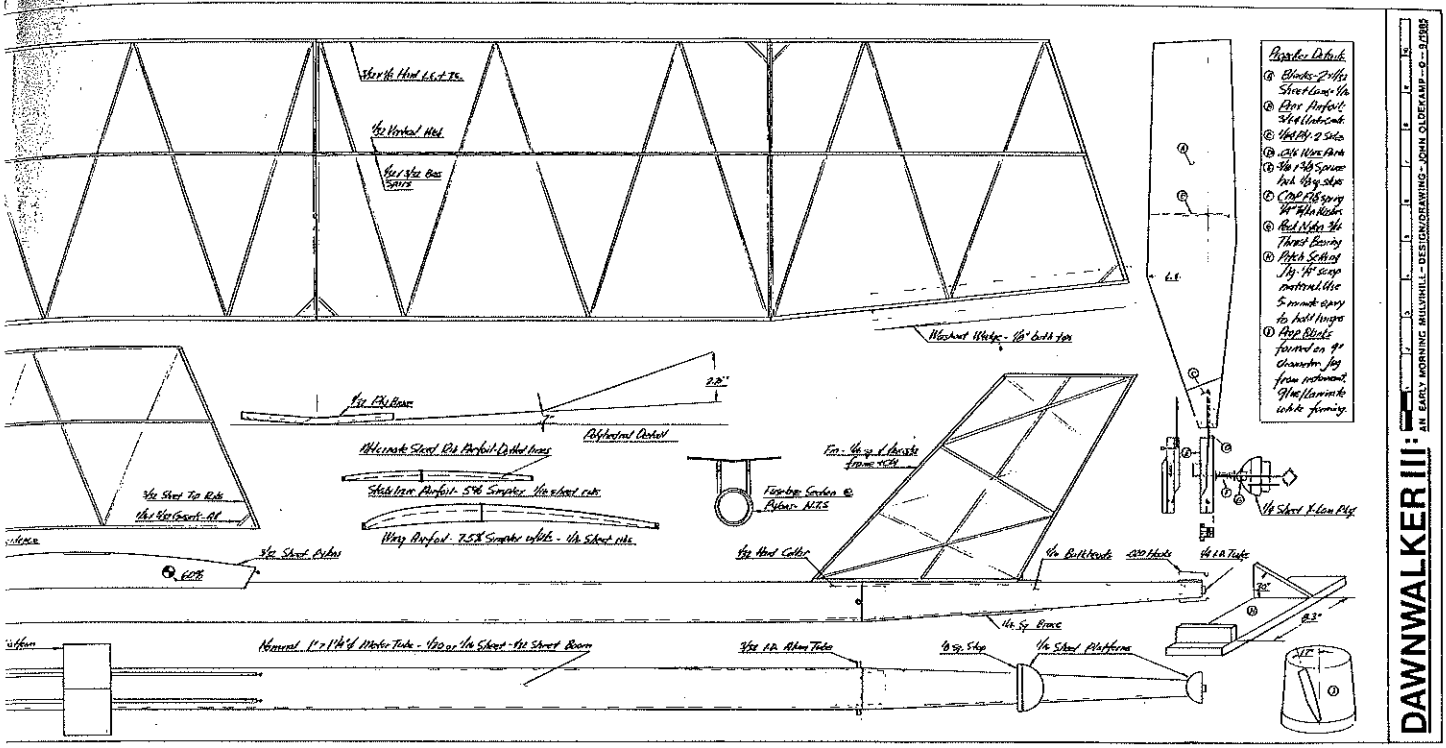
Uncovered weights are .5 gram for the fin and 1.8 grams for the stabilizer (2.5 grams for both could be tolerated). Sand the pieces well, and set aside for covering.

Wing. It is helpful to line up pins for locating the LE and TE with a good straightedge. Pin these pieces in place. From a plywood template, cut out the ribs. Cut and fit each diagonally, but do not glue them until the polyhedral ribs are also cut and fit and set to the proper angles. My method is to prepare angular templates from the polyhedral plan, then glue and set these ribs before adding anything else.





Left: Wing structure at center section shows external spars, webbing, dihedral keeper, and lightweight gussets as are often seen on indoor models. Ribs are from medium-to-firm 1/16-in. quarter-grain sheet. Right: Internal spar and diagonal components of the fin are made of basswood. The frame is of firm, springy stock. Glued with cyanoacrylate in very small drops, the covered weight will be under 1 gram.



Tip washout should be shimmed as indicated. As insurance, I actually "crack" the TE, then douse it with CyA to hold the setting. The shims are razor-planed to contour and can be used over and over. Lastly, add the top external basswood spar.

Remove the whole wing from the plan, and turn it over for gluing on the bottom spar. Fudge in the vertical webbing as shown, and glue in place. Air loads on this lightweight model demand use of the webbing, so do not leave it out.

Sand everything, cut the panels apart, prop up the units, and install the proper polyhedral. After this, add the ply brace at the center by hogging out holes in three center ribs for insertion; glue with CyA. The uncovered wing should weigh 12 to 16 grams.

Fuselage. I dislike making rolled-tube motor sticks, but they are unparalleled for strength/weight, so I bit the bullet. My methods might even lessen the pain and make a convert of you.

The plans call for nominal dimensions based on availability of materials. If you can buy good A-grain stock that weighs nine to 11 grams per 4-in.-wide sheet, by all means go to the larger diameter. I used closet rods from the lumberyard as mandrels, with the rear 10 in. or so tapered with a razor plane to form the upward-tapering "boom." For the straight part, sand out a nice sheet of balsa on both sides, then dope *one* side three times with thinned-out nitrate dope. Sand again when the dope has dried.

Hold this blank, undoped side up, under the bathroom shower for about 30 sec. with the water as hot as it can get. Try to keep the doped side dry (and to not fry thy hands). Pat dry, then sort of wrap/coax it around the mandrel. Hold in place with masking tape or rubberbands. Try to get the seam very straight. (You should have cut the sheet approx. .06 in. or so wider than the indicated circumference: $\pi \times D + .06$ in.) Set this unit outside in the sun or near a benign heat source. Under good conditions, the blank will take a set and be dry in about an hour.

When dry, start to wiggle the blank a bit to make sure it is free of the mandrel. You may have to slip a card under the seam to free it up, but once you are sure it is free, it is time to glue the seam; do so while holding everything over a paper bag (or over the back lawn).

While pulling the tube off the mandrel, seam pointed down, tack-glue it every inch or so. As long as it is pointed down, the CyA will not bite you! Once off the form, set the tube upright in the paper bag (a piece of wax paper in the bottom) and run a fat bead of CyA down the intended seam, letting gravity work for you. After squaring up the ends with a sanding block, install the collars as shown, then set aside.

The boom is similarly formed with dope and hot water, but it should be made of 1/32 A-grain sheet. It should either be measured or a gore made for a pattern. Form it, dry it as above, and tack-glue the seam as it is removed from the mandrel.

Cut and glue in the circular bulkheads. I cram them in place with a long dowel and then "dive bomb" them with CyA glue to keep them in place. They are essential to

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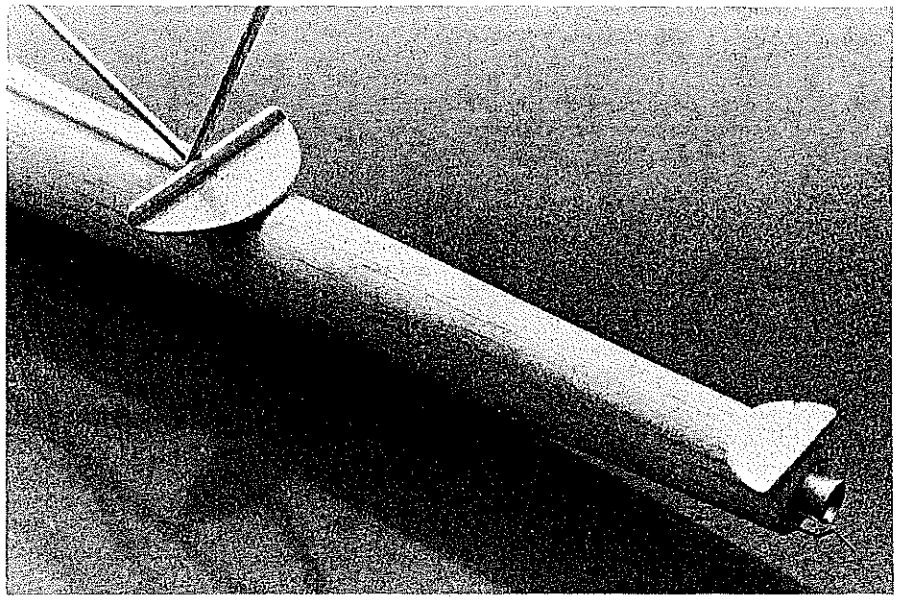

Superlight stabilizer platform and dethermalizer system have proven reliable on several of author's previous models. Hold-down hook and fuse snuffer complete this simple setup.

FF Duration/Murphy

Continued from page 149

have suddenly appeared everywhere again and are being listed at $6.95—but are on sale at $5.91. The mechanism seems somewhat smaller than the version that I last saw on the shelves; however, the spring is very strong, and they can be rigged up to be used as a fuel shutoff very satisfactorily. I won't attempt to explain my pet apparatus design as to how I harness the mechanisms for fuel shut-off use, for it seems that nearly every Gas flier has his own patented device, and my conversion is by no means unique. If you have something a little different and surefire functional, we would certainly be interested in relaying your design to our readers.

Well, it's about time that I disappear for a while (two months) as well. So, see ya' downwind!

Harry Murphy, 3824 Oakwood Blvd., Anderson, IN 46011.

FF Indoor/Tenny

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form is twisted like a prop blade so that it will fit flat on the prop block. Thus, when the outline is formed, it is already properly curved and twisted. If this is not done, the outline should be fitted on the block during construction, moistened to relieve the stress of twisting, then glued to the ribs and spar after drying. Note that if the outline is moistened *after* being attached to the ribs and spar, the wood will expand and stress the whole structure.

Prop covering. Prop blades should be covered on the prop block, if possible. Otherwise, if water or saliva is used as adhesive, cover and trim the prop and return it to the prop block until all moisture has evaporated. Also, if the prop is not covered on the prop block, the film must be slack enough for the blade to lie on the film without distortion. If not, the blade twist can be changed during covering; the film will be too tight to let the blade resume the normal twist without stress.

Another important tactic is to be sure the film is attached to both the outline and the ribs. This accomplishes three things. First, if moisture is used as adhesive, the entire blade expands evenly, minimizing stress. Second, the individual panels of film are small enough to stiffen the blade. Finally, damage to the film in any single section won't spread to other sections.

Don't worry about wrinkles which appear as the blades dry out; a simple operation will remove them. Use a very fine artist brush moistened with water to work out the wrinkles. Stroke the brush along each wrinkle; it will pull up level with the film around it. After all the wrinkles are treated, let the whole assembly dry again. Finally, store the prop in a holder which keeps the blades from touching anything.

Prop innovations. A number of different plastic props are available. One of the photos shows how to convert one to efficient pusher operation for Peanut Scale models. The freewheeling ratchet on the front is trimmed flat to make a bearing surface. Then the shaft is projected through the hub and bent over to push against one blade. Al Backstrom flew this setup at Bedford Boy's Ranch in Bedford, TX.

Another photo shows the same basic prop hub as in Photo 1. In this case, the small plastic blades were removed and much larger balsa blades substituted. The model is a Profile Scale model flown by Randy Randolph, again at Bedford Boy's Ranch.

Novice Pennyplane has a rule limiting prop diameter, so how do you handle the power a three-gram model needs? Jim Clem is trying very wide blades: 2¼-in. wide on a blade which is only six inches long from shaft to tip. I'll report the performance as soon as I can get some numbers.

Next time: prop blocks and prop-covering techniques.

Bud Tenny, Box 545, Richardson, TX 75080.

Dawnwalker/Oldenkamp

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maintain rigidity aft of the motor peg and to form a mount for the DT tube, platforms, etc.

True up the main joint, slide the boom over the aft motor hard collar, and glue the works together with white glue or CyA. Eyeball everything into good symmetry.

Sand the whole fuselage, including the down and right thrust. Add platforms, the front edge strapping tape reinforcement and CyA glue (it "wicks" well into this stuff), and make up the pylons, pins, wing platform, etc. Sand the wing mounting unit to contour, but do not glue it on yet. Make and drill the nose plug. You may want to spray

the fuselage components with a light coat of Krylon Crystal Clear B (#1301 or #1303) —but it is really not necessary—and sand with #400 paper.

Covering and assembly. One of the biggest stumbling blocks for us was in locating lightweight covering materials. After trying and rejecting several, we were fortunate to locate a non-modeling product (I have dubbed it Skywrap©) that weighs about 40% of the best tissue, adheres with either white glue or RC56, shrinks under passive heat (an open oven door), accepts spray dope for color accents, can be drawn on with drafting ink, etc., and which is quite strong and puncture proof. It is the stuff commonly used at supermarkets for taking home your veggies. As plastics go, it is amazing stuff. The sample roll I am using is from Conoco, North Carolina. If you can find the stuff, don't be afraid to use it. I am currently trying to arrange a supply in unperforated, unprinted lengths for mail order sale.

Ordinary modeling tissue will work, but do things carefully. Finish off with a weak alcohol spray, then two thin coats of plasticized nitrate dope or Krylon Crystal Clear. Your tissue job will probably sag in damp weather. Do not despair; that is the nature of this beast. If you have used Skywrap, no such problems will occur.

Either way, try to get a smooth job. Add the usual AMA numbers and identification label with your name, address, and phone number. A big splat of color on the left wing tip will help the timer keep your plane in sight.

You should have the prop assembly finished and put on all the platforms, etc. Line up and install the vertical fin. Mount the stabilizer with rubberbands, and put in a hunk of DT fuse. Strap the wing to the pylons/platform unit. Add the prop assembly to the front, and set up the model over a knife-edge surface for balancing. You may need extra hands for this operation.

Nudge things around a bit until the correct balance point is achieved, then pencil-mark the pylons and motor tube—and Hot Stuff the wing mount in place over your marks.

Take a few minutes to admire your finished product. Check for warps and misalignments. Since this is a purpose-built aircraft, it really will not tolerate any gross aberrations. Carefully weigh the whole unit, taking note of the gram readout. Mark that figure down on the plane somewhere.

Trimming/flying. Assuming an airframe weight of 55 to 60 grams, beginning power should be 12 strands of ⅛-in. rubber approx. 40 in. long. Make up three motors. Lube them well, and let them rest overnight. Two of them should be dried off, broken in, and wound to the breaking point (sounds wasteful, but rubber batches vary greatly—even within the same batch!). Make a note *on the airplane* of the max wind figure, then make a deal with yourself to never to exceed 90% of that figure—even when going for the gold. You can credit George Perryman with that tip.

If you insist, try some test glides with a motor installed and the prop folded. A thin shim will probably be needed under the rear of the stabilizer—as much as 1/16 in. If all looks appropriate, crank in 400 turns and launch, allowing the model to fly out of your hand. This won't be a ball of fire at this point.

Stalls are cured in the usual way: add downthrust and minor right thrust. Hopefully altitude will be gained, the prop will fold, and the glide can be observed. Resist over-elevating! This ship wants to go low and slow and take forever to get there. If you clock the prop rpm, you will get about 150. Add power in bunches of 100 winds, shimming/trimming out any unwanted tendencies.

Eventually you will have worked your way up to 1,150 turns, and the beast will come alive like the proverbial butterfly, proudly justifying its crafty and competitive builder. (One should not, but one *can* get emotional at witnessing these kinds of aerodelights.) The ship is strong enough to be flown in zephyrs pushing eight knots, but you are on your own after that point.

Changes. Dawnwalker III is a starting place if you wish to explore maximum Mulvihill performance. Dawnwalker I used the sliced-rib alternate shown on the plans, and although it flew very well (we even flew

it indoors at a club meeting!) and won a trophy, a strong belch would throw it off course into a terminal tail slide.

The airfoil shown should very generally allow better penetration of turbulence, provide a superior glide, and be somewhat more durable. One *could* increase the motor tube in length, but I do not believe that would appreciably enhance performance. V-dihedral has been tried as have taller pylons; neither added much except structural problems.

The heart of this design is a low aspect ratio wing with a very slow prop/rubber combination (as opposed to the more traditional out-of-sight climb/glide mode). The uppermost thought was the fun of pursuit toward a worthwhile goal from an unconventional point of view. We hope those of you who build and fly this project will extract the same pleasure from it as we did.

CL Scale/Boss

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patibility chart in my May 1985 column.)

The stiffened cloth will not only be easier to work with but will look much neater. All the threads will be straighter, instead of the wavy and squirrelly look you can't avoid when using the standard application method.

This item by W. Rozelle was found in *Wing Tips,* the Newsletter of the Mid-Hudson Modelmasters and was courtesy of SAM who reprinted it from *The Corsair* (and so on).

Mini-contest report. Roland Baltes (San Pedro, CA) reports that the Southwestern Regionals held at Buckeye, AZ is once more seeing a fair turnout in the CL Sport Scale event. This year's event, held in January, had an entry of nine models, four of which were twin-engine types. Weather was good, temperature in the Seventies and wind at a minimum: an excellent day for Scale flying.

Some of this month's photos (all by Roland) are of Buckeye entries. Roland commented that nine entries may not seem like much of a happening, but for an area that hasn't seen a Scale meet in over a year, a turnout of nine is considered fairly good. Roland expects to be at next year's contest and hopes to be able to report another good increase in activity.

Please send all correspondence—and especially photos—relating to CL Scale to Bill Boss, 77-06 269th St., New Hyde Park, NY 11040.

CL Aerobatics/Fancher

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More than any other maneuver, the Square Eight is helped by an aft center of gravity in the wind. Because the plane's speed increase opens up the corners, it is tough to keep the maneuver the right size.

As I mentioned last month, this is a horsepower maneuver, and a strong engine will be worth its weight in gold in maintaining line tension and resisting speed increases. One hint if you haven't a great engine: make the maneuver tall and narrow so that you spend less time trying to penetrate the wind. It won't be perfect, but you will be able to complete a recognizable Eight.

In calm air, move backwards during each top horizontal leg, thus allowing the critical areas—all bottom corners and each intersection—to be flown free of wake turbulence. Also, avoid hitting the corners hard in the calm, as the high drag which results will sap airspeed and horsepower. A weak engine can run out of steam in the long and difficult Square Eight. Whipping for a couple of laps prior to entry will build up a little stored energy.

In good air the Vertical Eight is quite easy. If you can find a cloud at 45°, use it for the intersections, and simply fly two perfect loops one on top of the other.

If the wind is up, it becomes a lot tougher. On the way up, never let the fuselage get horizontal in the intersection. If it does, you will never get the top loop round or the right size against the wind. Reverse control just before the path of the airplane starts to descend, regardless of its body angle. Once you get to the top, consciously apply more Down control to maintain the radius of the outside loop and to make the intersection as the wind blows you down. Here is the one exception to the rule of never seeing the body angle tangent to the intersection before reversing control. Allow the flight path to just stop descending before giving Up to complete the Eight. Try to avoid the non-pro look of climbing inverted in the intersection.

This is a relatively painless calm-air maneuver. A step or two just past the intersection on the way up should be enough.

The Hourglass is probably the most mistreated of all maneuvers, and almost all fliers make the same errors. As in the Triangle, the first corner is turned too far and the resulting climb angles far off to the flier's right. The second error, often in combination with the first, is not making the top leg parallel to the bottom. Both errors result in the plane being in a position from which it is impossible to complete the maneuver acceptably: either in front of, behind, or directly over the head of the flier.

The solution (in addition to horsepower) to the first error is to stop the first corner just as if you are flying a correct Triangle, so that the resulting climb is steep and only slightly in-