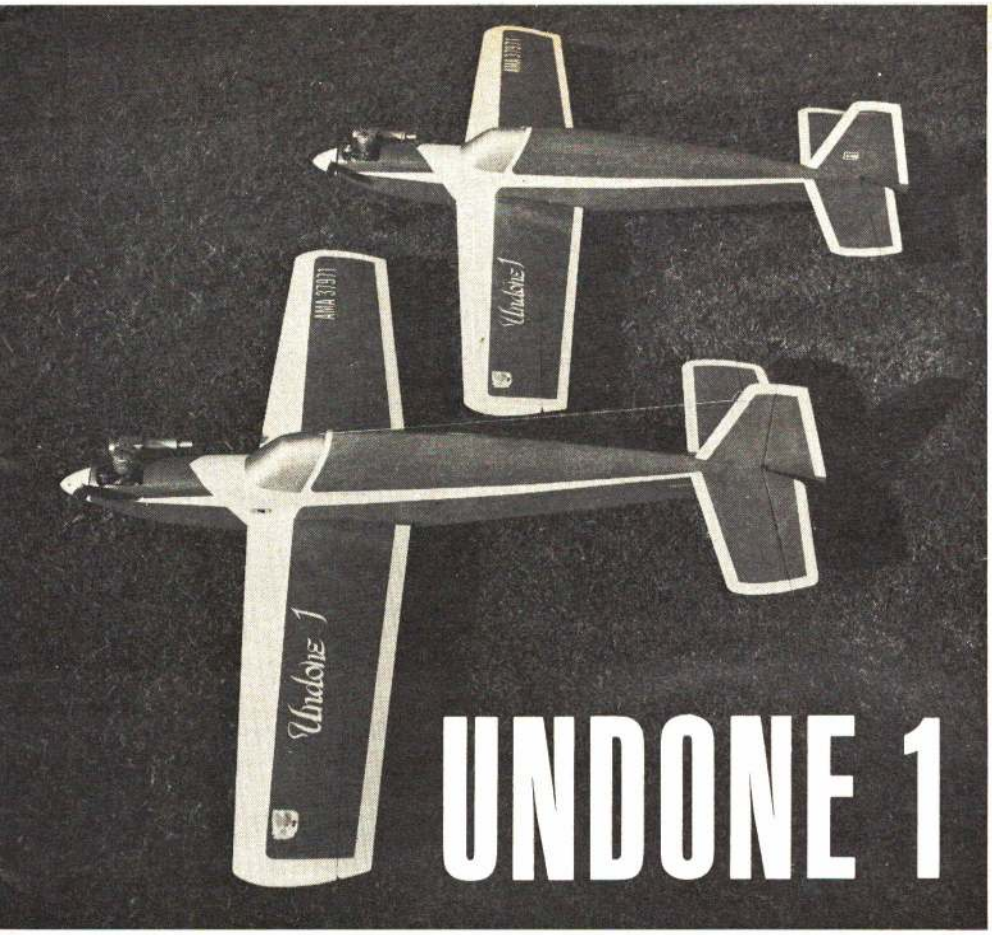


UNDONE 1

Hottest thing in R/C pattern, was winner of several events at recent West Coast Championships.

BILL HEBESTREIT

THE *Undone 1* germinated in my mind for years, but I never got around to getting it on paper. Then two wipe-outs on successive weekends — groan, nothing to fly — dictated a crash program of design and construction.

Using a semi-scientific approach, I took the moments, areas and weights for the Kwik Fli, Bar Fli, Henchman and Sportmaster and plotted them with respect to CG, then with the thrust-line constant and, finally, on the basis of lateral area only with CG constant. And that's it for science.

Frankly, after I'd faired in all the lumps and scientific points it looked horrible. So I raised the thrust-line some, moved the wing up a little, added a few curves, erased all the extra lines and — presto! Brand X was conceived.

With the profile established, I added structure details, borrowing ideas from other models. The somewhat unorthodox two-piece fuselage formers are provided so the basic fuselage can be assembled upside down on a flat bench. Wing dowels are attached to the fuselage using a shear plate in the leading edge of the wing. In a crash, plan ahead. The plate shears at the glue points leaving the wing and fuse relatively intact. My planes have survived several dramatic landings this way.

The ailerons appear deceptively small for this size plane, but the tapered wing area is only 571 sq. ins. The airfoil is straight off Lou Andrews' Sportmaster with no improvements. Tail group is Kwik Fli III with the stab shortened ½" and 1" lopped off the vertical.

The name came about during the first flight. Takeoff required a nudge of up, then hands off for a 10-pointer. A touch of down trim and it's straight and level. So far so good. First turn, oops, on its back. Gotta slow down the ailerons. Three rolls now — wow — too fast, but on the wire. Loops? Beautiful. No corrections needed. How 'bout a loop with a snap 'n a half? Ease in up elevator. Now, stuff the sticks in the corner. What happened? That airplane just came all undone.

Let's try something safer like a knife-edge. After all, the main reason for all that fuselage area was the knife-edge anyway. I'll cheat a little 'n pick up the nose first. Now the roll. Now the rudder. Where'd it go? Would you believe a 100 ft.-diameter rudder loop? This thing's just full of surprises.

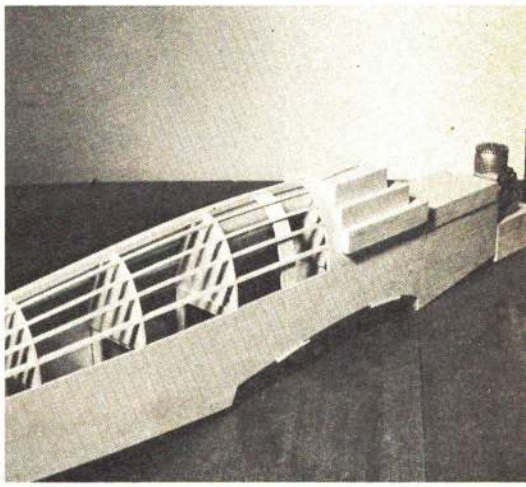
Construction: I won't go through the usual admonishments about "not for the beginner," because I don't care who builds one. Although the ship is tolerant up to a point, there are two absolute requirements: no warps and keep it under 6 lbs.

Select all your wood at one time if possible, and match up sets of sheeting for each wing panel and stab. Set aside until ready to use. Trim and glue sheeting just prior to use for minimum warping and tighter joints.

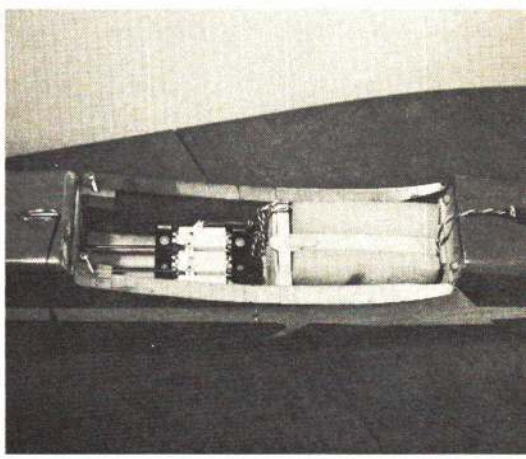
Fuselage: Prepare sides and add ply doubler. Trim the top edge and rear net. Leave a little trim on the front and bottom of the ply. (This provides a little leeway for misalignment when joining with contact cement.) Trim net after joining, match up F3 and W1. Drill dowel holes and set aside. Join the sides, F3 and F5. Set on top of work surface with F3 hanging over the edge of bench. Clamp, but *do not glue* tail post. Then progressively add F4 through F9. Using a square or triangle, align and glue tail post holding it square to the work surface. When

Continued on page 69

The original name was Kwik-Bar-Henchman-Fli-Master because it incorporated valuable features of these popular R/C craft.



Construction method insures alignment and permits very light-weight structure. Carved cockpit provides strength above wing cutout.



Unusual wing hold-down has dowels glued to fuselage with sheer plate glued to wing leading edge. Has saved model in crashes!

A delightful contest flyer with 60 engine. Airfoil permits slow stable landings; keep weight under 6 pounds — and no warps!

Undone I

Continued from page 21

dry enough to work, add corner strips and bottom sheeting between F5 and tail post.

If you don't mind the stab in your way while working on the rest of the fuse, you can build it now and glue it in place so it'll be square and true with the fuse. Temporarily glue a piece of 1/8 x 2 x 3½" across the wing saddle between F3 and F4 and between F4 and F5 to maintain alignment during balance of construction. Now add F2 and T.E. stock in tank section.

When dry, remove from bench and add F4T and F9T, noting that F4T goes aft of F4 and F9T goes aft of F9. Temporarily glue a piece of ¼" sq. between F3 and top of F4T just below the ¼ x ¼ stringer notch to maintain alignment while adding stringers. Now add ¼" sq. top stringer gluing to F4T *only*. (Do not cut off excess length.) Put a rubber band around fuse and stringer at front and back and adjust position to obtain appropriate curve shown on plans. Now add F5T through F8T, but don't glue yet. When satisfied with fit, glue in place, noting that F5T goes forward of lower former, fit F10 and glue in place.

If you've been puzzled over the missing notches in the top formers, it's not that I'm too lazy to lay 'em out; it's just that I've never been able to cut perfect formers yet.

Starting at the top (either side), lay a strip of 1/8" sq. spruce or hard balsa in place, picking up the marks on F4T. Stick a pin in F4T on both sides of strip. Tuck the aft end of the strip under the rubber band by F9T. Now adjust strip position at each former to obtain a smooth curve when sighting aft from the front of fuse. Mark the formers, remove strip and notch 1/8 x ¼" deep. (Do not notch F9T.) Add stringer and glue in place with butt joint at F9T. Tuck front end of stringer under rubber band at front of fuse. Continue on same side until all four stringers have been fitted in place. Now take a narrow strip of bond paper and wrap it around the stringers at F5T and mark stringer spacing on paper. Flop the paper over to the other side of F5T and transfer marks to edge of former. Repeat this for the remaining formers. You can make a quick check with the 1/8" sq. strip before you cut the notches. The whole process takes longer to describe than to do, but nothing spoils the looks of an airplane more than wavy zigzag stringers.

The 3/32 x 1" filler pieces between stringers are in lieu of another former and necessary to maintain stringer contour. After they're dry, trim all stringers flush to F4T. The fillers just aft of F4T aren't mandatory, yet provide a smooth transition from stringer to former when covering is applied.

Add the engine bearers and nylon nose-gear bearings. Fit the engine and install blind nuts in bearers. Drill F2 for throttle rod. Glue in block under tank section and all nose fairing blocks. Coat oil drain groove with epoxy, or as an alternative, insert a piece of ¼" dia. aluminum tubing. Carefully mark fairing blocks and trim front end to fit plywood nose ring. (Try this: Drill a hole in a piece of scrap motor bearer stock, bolt it on like a prop. Trim the fairing blocks to clear it by 1/8". Use a fly cutter with a removable ¼" diameter pilot drill and set the diameter to 2½". Remove the pilot drill. Clamp the cutter onto the crankshaft and rotate the engine one full turn. This makes a perfect reference mark to sand the fairing blocks and align the plywood ring.) Glue ring in place, remove engine, and add F1.

If you object to carving up all that balsa for the cabin, you can use a foam block or molded fiberglass. But be sure to plank the top of the fuse between F3 and F4 to carry the fuselage torsion loads over the wing cutout.

Trim triangle stock to size and glue in place between F3 and F4T making sure they provide a flat surface. Cut hatch cover to fit between F2A and F4T. Add remaining blocks between F3 and F4T, spot gluing in center of blocks only, so they'll be easier to separate later. Now carve and sand to final shape. Split the blocks and remove excess material until approximately ¼" wall thickness is left. Then glue permanently in place. Trim nose fairing blocks to clear carb, needle valve and throttle arm.

Wing: Assuming you've obtained the cores from your favorite source, start by making the cutouts for the aileron bellcranks and landing gear mounts. Mark the cores so you don't end up with two left halves. Install landing gear mounts with epoxy.

Sheet top of wing and add trailing edge. When dry, sand trailing edge to shape, then sheet the bottom. Before putting adhesive on bottom side of core, place ½" wide strips of masking tape around edge of bellcrank cutout to simplify removing access hatch later. Trim excess sheet from leading edge, sand flat and epoxy leading edge strip and tip blocks in place. When dry, carve to shape and rough sand entire panel. Carefully lay out access hatch and remove by cutting just through the balsa skin, gently prying it loose from the foam core. Save the part you removed. You'll reinstall it later.

If you don't think you can find the exact location of the core cutout, cut a 1" square out of the middle of where you think it is and take it from there. Lay the wing half on the bench upside down and mark the entry point for the aileron rod at the center section. Take two pieces of scrap motor mount stock and lay them on the bench in line with the aileron rod axis. Put one next to the center section, and the other about 12" away.

The next step requires a good eye — and a steady hand. Heat the end of a length of 1/8" dia. piano wire until it's dull red. Remove from heat; wait about five seconds, then place wire on the hardwood blocks and push hot end into core. You may have to re-heat the wire several times before you get through to the bellcrank cutouts. This makes approximately a ½" dia. hole. Do the same for the other wing half. Then join the wing halves with masking tape. Install bellcrank platform and bellcranks. Carefully measure and bend bellcrank tie rod.

Separate wing halves and insert rod to check fit. When satisfactory, join wing halves with epoxy and tape to hold alignment until epoxy cures. Sand joint and coat wood with a 2" wide band of Ambroid, scraping off excess. When dry to the touch, add second coat and cover with 1½" wide pinking tape, forcing cement up through the fabric. This is all you need — no glass, no resin, no spars or joiners. When dry, make servo cutout and glue servo platform in place.

Trace the aileron and aileron cutout and make cardboard templates. Mark aileron location on wing and temporarily install aileron horns. Cut hole for pushrod, using the hot wire again. Cut and fit pushrods. Remove horns and cut ailerons loose. Add spars and closing rib to wing and ailerons. Make servo cutout and install servo. Make slots for hinges and temporarily install ailerons and pushrods. Swing ailerons through full travel and clear any interferences that occur. This is your last chance to work on the bellcranks and pushrods, so don't rush the fit check.

Now glue the access hatches in place and finish sanding entire wing. Fit the wing to fuselage and install W1, dowels and drill for screws at trailing edge. The 1/32" ply saddle can be added now, but leave the leather fillets off until after covering. I have yet to have a wing saddle fit the wing on the first try.

Assuming that the horizontal is square and true with the fuselage, put the wing in place and shim if necessary to line up with the horizontal. Now mark and remove high spots as necessary, being careful not to lose the wing incidence relationship.

Epoxy the wing dowels and W1 in place. When dry, add W2 and drill and tap for hold down bolts. With the wing bolted in place, slip a strip of No. 50 grit garnet paper between the wing and fuse. Sand fuselage until there's only a slight drag on the paper. This will remove just enough material to fit the 1/32" plywood saddle. Cut the plywood in 3/4" wide strips with the outer ply grain running spanwise. Glue in place with approximately 1/8" overhang on inside of fuse. Bolt wing on and tape ply to wing if necessary to hold proper curve until glue dries.

Now comes probably the most tedious part of the construction — the bottom wing fillet. I can't suggest an easy way other than carve until it fits. Don't skip the two dowels for the hold down bolts as they help to stabilize the bolts. I started out with No.4-40 x 1½" bolts. After several hundred flights and a few touch 'n crunch limbo passes they got sloppy, so they were opened up to No.6-32 and are doing fine now.

Finish: The original models are covered with one layer of GM silkspan and a standard butyrate dope finish. If yours looks like it's coming out heavy, the only solution is MonoKote as we're already down to the minimum thickness on the balsa wood.

If you decide to go the dope and silkspan route, the fuselage sides can be covered in one piece provided you run the grain vertically. If you cover the entire model with one layer of silkspan, it only takes two coats of sanding sealer over the paper to prepare for the base color coat.

Flying: Except for a small amount of incidence in the wing, the first two models were set up with "zero everything" and have not required any changes or trim. To me, the Undone I feels comfortable when trimmed to require a slight but conscious back pressure on the elevator with a full tank of fuel.

Ground handling on pavement, even in severe crosswinds, is excellent. If you normally fly from a dirt strip you may have to bend the main gear aft about ½" and change the nose wheel to a "low bounce" or "slick." As an alternative, a fast idle, down elevator, and brakes will work. Just for the pure fun of it, you can taxi around on the main gear by holding a little up elevator, and with a fast idle the rudder is fully effective for steering.

In the air, control response is pretty rapid and you may find yourself doing too much "piloting" at first. This characteristic is intentional and was achieved in part by concentrating as much of the non-structural weight as possible near the intersection of the pitch/yaw axis. It's a pleasure though to achieve consistent spin and snap roll recovery by just neutralizing the controls.

For honking around or a little impromptu pylon racing the ship will tolerate sloppy flying up to a point but if you are at all serious about the pattern, take your time to line up the wings for a level entry in all maneuvers. Crosswind loops require the most concentration but in most cases holding a small amount of aileron throughout the loop is more effective than corrections during the loop.

There are only two ways to land the Undone. One is the long shallow approach at part throttle where you start the flare about 5 ft. high and control the touch-down with power reduction.

The other approach is to chop power just prior to the crosswind turn and kill your speed by holding altitude on the crosswind leg. By applying a small amount of power and making a shallow turn onto final you are set up to put it down right in the circle.

I got in quite a bit of dead-stick landing practice while trying to use too low an idle speed on a new engine and found the short approach with shallow turns worked equally well on both up-wind and down-wind landings.

I'm a sport flyer at heart, still plowing along in Class-B, and am really looking forward to seeing this design in the hands of some serious flyers who can realize the full potential of the Undone.