

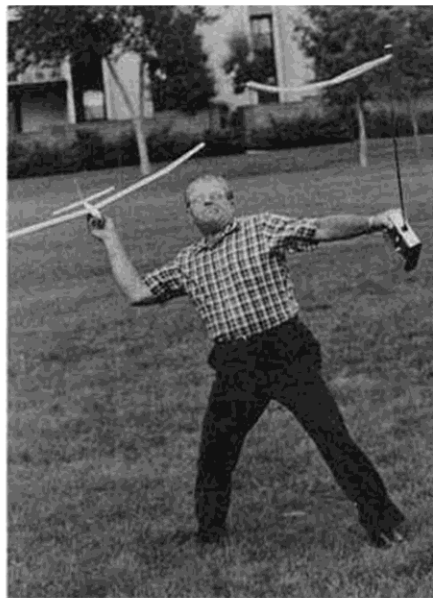


Feather

By NOBLE KIRKPATRICK, design by FRANK GREEN. . . Here's a small, lightweight high-performance hand-launch sailplane with a 43-inch wingspan. Construction is simple, flying is exceptional.

- As a result of experience, there were several features that I thought would be very desirable in a hand-launch sailplane. Having crashed a lot in the past, I thought a strong crash-resistant design would be a good place to start—then things began to fall together. Strong, to me, meant small. Small meant greater potential launch height. Small meant cheap. I also thought small would have its own special appeal. All of the above have proven true. Let me tell you about crash resistance first.

One of the weakest areas on most radio control HLGs is the wing hold-down screw at the trailing edge. The Zephyr is a good example; drag a wing tip and there go the fuselage sides. However, by anchoring the wing at the leading edge and holding it down at the spar with a screw into a good strong block, well-supported in the fuselage, a trailing edge of the wing will move while the wing absorbs the shock and no damage will result. Many craft have been lost on a downwind turn because of insufficient rudder travel and the inability to pick up that low wing. The Feather has an outrageous rudder with a great deal of travel; like brakes on a car, it is there if you need it. Yes, it will absolutely destroy light thermal flight if used excessively; but adequate control throw is a joy when working in close for a hand catch. Another point to



Designer of the Feather, Frank Green, gives it a heave. It's a great park flyer.

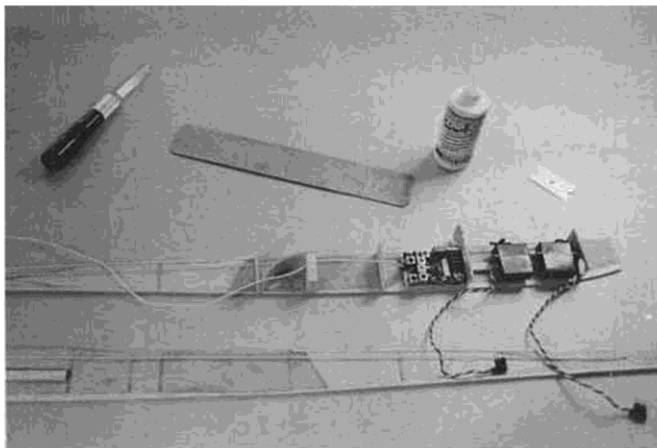
remember: with adequate control throw, good thermal flight could be accomplished on trim alone. The bottom line is: don't bitch about a sensitive airplane—learn to fly it.

As for construction, 1/64 plywood is used

extensively in the fuselage. The servos actually serve as bulkheads. Good hard balsa servo rails and the application of 1/64 plywood create a fuselage that is exceptionally strong. Please build it that way. You can even glass the nose with .6-ounce cloth with a minor weight penalty. The first Feather weighed exactly 7-1/4 ounces ready-to-fly and required *no* additional weight for balance at the CG. The flight pack weighed just under three ounces with a 100 mA battery pack (no case), Vanguard (Royal) four-channel kit receiver (no case), two World S22 mini servos, and hard wiring (no connectors). With *no* wind and good lift, the first Feather flew reasonably well, but I soon found that additional weight was required for really good performance—8-1/4 ounces seems ideal and 10 ounces maximum for really bad wind. Don't try to build light—I didn't on the second Feather, and it came out at 8-1/4 ounces with about 1/4 ounce of weight in the nose for balance. Penetration is excellent, and light thermal capability is also excellent (unless flown too slow). If you insist on building light (under 7-1/2 ounces), then I would suggest you reduce the wing span by two bays for slightly under 38 inches.

CONSTRUCTION

The construction of this small wonder is, for the most part, fairly standard; and the ex-



Fuselage construction, showing location of radio gear.

perienced builder should have little difficulty putting it together. However, there are a few things that you need to know in order to smooth out the process:

GENERAL

I think it's a good idea to Xerox patterns for the wing ribs, fuselage formers, etc. and then cut out all of the parts so that once you start the actual construction, nothing will slow you down.

FUSELAGE

Once the parts are cut out and ready to go, you can begin assembly of the fuselage. My entire plane was constructed with CA glues, and I highly recommend using them, whatever brand you use. Just make sure that when you glue the stiffeners and the 1/64 plywood doublers to the fuselage sides that you make a left and a right side. After you add the 1/64 ply doublers using slow CA, you can add the 1/4-inch servo rails. Slot the fuselage sides at the rear to allow the control cables to pass through and glue the cable sheathing in place along the fuselage sides. CA the pushrod tubes to the fuselage sides to prevent buckling under load and cross them at the fuselage rear exit points in order to allow for smoothest possible mechanical action; i.e., prevent kinking. Before gluing fuselage formers 1 through 5 in place on one of the sides, you should make sure that the formers are wide enough to accommodate your radio receiver, and remember to consider the space taken up by the control cables as they pass all the way through the radio compartment to the servo area forward of the wing. When you are sure that your radio gear will fit the small areas provided, you can join the fuselage sides at the front formers. But, before you do, make certain that all formers are set square and true. When joining the sides, check that the two sides align exactly, and be careful to avoid the dastardly "banana-shape syndrome" when you join the fuselage at the rear post. When it is time to sheet the top and bottom of the fuselage with 1/16-inch balsa, notice that the plan calls for the grain to run lengthwise. This is not the common practice, but it seems to add greatly to the strength of the fuselage, preventing it from snapping in unreinforced areas during those rough whiplash landings that occur from time to time.

TAIL SURFACES

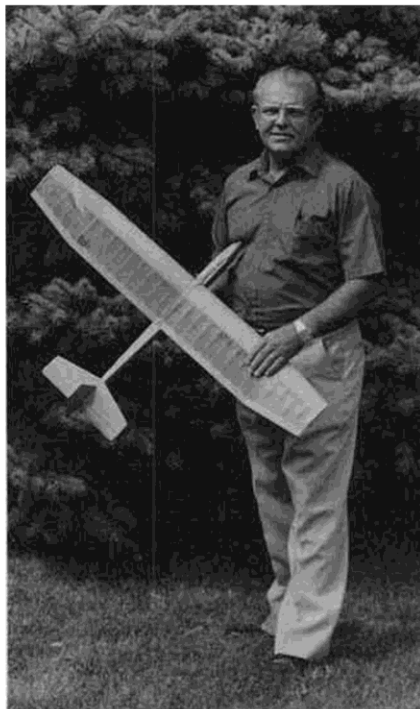
After the fuselage is finished, you can

round the edges to the tail pieces and put a 45-degree bevel on the side of each of the control surface edges—this allows for the tape-type continuous hinges that will be used. The lightweight control horns that are shown on the plans are formed easily from small paper clip wire.

NOTE: You should not attach the control horns until the control surfaces have been hinged. The control horns can be fastened in place with CA, but the area around them on the control surfaces should be reinforced with 1/64 plywood or epoxy to prevent them from breaking loose under flying stresses.

WING

Construction of the wing surfaces is pretty much as you might expect, if you are familiar with "D" tube-type structures and shear webbing. The center sections can be built flat on the board, but it will be necessary to block up the trailing edges of the tip panels to create a 1/8-inch of washout. I don't advise trying to warp in the washout after the covering is on because this wing is very rigid when construction is complete.



Designer Frank Green with the Feather HLG.



The bare bones of the Feather before final assembly and covering. There aren't more construction photos because construction is so darn easy! Anyone with some building experience can do the job.

When the layout of the basic wing structure has been completed, form the tip dihedral joints followed by the center joint and add the 1/32 plywood dihedral braces to each side of all joints. This is the time to add the shear webbing to the interior wing panels because it becomes a might tedious after the leading edge sheeting is in place. Use a nice medium-weight, straight-grained balsa for the leading edge sheeting; and do not attempt to sand this sheeting after it has been glued in place because you'll just produce a weak, "riffled" surface.

A less hard piece of trailing edge stock can be used to make the tip panels, if you prefer. Do not be tempted to omit the 1/16-inch wing gussets, as they contribute considerably to the strength of the wing.

NOTE: Ribs R-1A are identical to Rib R-1 except that they must be installed on either side of the plywood dihedral braces and, therefore, must be cut in two and installed after the dihedral has been installed in the wing joints.

COVERING AND FINISHING

I don't own stock in the company that produces Micafilm, but I do insist that this material is the only sensible covering for these little hand-thrown birds. In the first place, it is light, light, light! And in the second place, it is almost puncture-proof compared to the other heat-shrink covering I have used. The clear (3/4-ounce) Micafilm is ideal for this project. It goes on easiest of all the Micafilm colors, and it looks great when it has been shrunk into place. (Like silkspan with beau coup coats of clear dope flawlessly brushed on, old timers.) Of course, you have to brush Balsarite on the framework wherever you want the covering to stick; but this is no big problem because it brushes on like clear dope and dries immediately. I do not recommend covering anything but the wing on this plane. In the past I have covered these little hand-launch gliders all over with heat-shrink films, only to end up spending a lot of time cursing when I had to peel them off to repair the minor damage that hand-launched R/C gliders inevitably suffer in the course of being flown in vacant lots and stubbled fields. Instead, revert to the proven practices of yesteryear and use several coats of sanding sealer on all the wooden surfaces of the fuselage and the tail

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surfaces. The results will be lighter and much easier to repair and maintain. If you insist on color, you can tint some clear dope with some kind of coloring agent and/or use decorations cut from MonoKote Trim sheets or colored tape.

CONTROL SURFACES

After the tail surfaces have been finished with dope and sanded, the control surfaces can be hinged. The neatest and simplest way to join the control surfaces to the flying surfaces is to use a MonoKote-type hinge as shown on the plans. The only difference is that I use a good quality plastic tape to form a continuous strip on each side of the control surfaces. This method is strong and safe, and the continuous strip reduces turbulence. The control horns are easily bent from small paper clips and should be glued in place after the control surfaces have been hinged, but before the tail pieces are aligned and glued on the fuselage.

RADIO INSTALLATION

The small size of this airplane demands the smallest and lightest radio installation that you can achieve (3 to 3.5 ounces maximum). Radio weight can be minimized by utilizing some or all of the following methods:

1. Use micro servos (not over .65 or .75 ounces each).
2. Remove receiver from plastic case and wedge in place in fuselage cavity with packing foam.
3. Don't use the standard switch arrangement provided with your radio. Instead, acquire a three-conductor audio jack of the Radio Shack #274-296 normally closed variety, and wire your battery pack to one side and your receiver to the other. This unit will act as both charging jack and on-off switch when used with a subminiature phone plug. If you glue a piece of ribbon several inches long to the rear of the phone plug, you will never launch your bird with its receiver off!
4. Wherever possible, remove heavy radio connectors and wire units directly together, avoiding the unnecessary extra weight penalty.
5. Mount servos using servo tape or glue in place with silicon adhesive. Even simpler, servos can be glued in place using CA. If a strip of masking tape is applied to the side of the servo which is to be mounted, CA can be applied; and when the servo is later removed, the masking tape can be peeled off without any marring of the servo case.
6. Be sure that you check the rotation of your servos making sure that the movement of the control surfaces corresponds to the appropriate movement of the transmitter sticks, unless you have a transmitter that features reversible servos.

FLYING

The Feather should balance somewhere between the front edge of the wing spar and 1/8-inch behind the spar. Start with the forward position and move back gradually because this little bird is very responsive. Check for warps and test-fly on a windless day over a grassy surface.

When you have a flat, straight glide, you're ready to give the Feather a hefty toss. Trim in a small amount of down-trim on your transmitter elevator control (to prevent

"zooming" into high-angle overhead stalls). Throw the Feather at a 45-degree angle straight away into whatever breeze there might be. It should climb in a straight path until just before it runs out of speed. As you gain skill, you will be able to zero the elevator trim at just the right point to get the plane to transition to level flight without a loss of altitude or flying speed. Once you notice that you have stumbled onto lift conditions, the Feather can be made to circle quickly and flatly into the bubble. The feather is smoothly responsive, and the only caution is that you must fly it fast enough to maintain its flight stability. As with most other high-performance soaring craft, it does not take kindly to being stalled in a tight turn. You will lose several feet of altitude if you do stall, and close to the ground this could be disastrous. So, keep your speed up in low-altitude downwind turns! The joy of this small soarer is that it will respond to very light-lift situations, allowing a skilled flier to float the Feather through the air like magic. Also, the small size and light weight means that you don't need to hire Arnold Schwarzenegger to do your throwing for you—the average, out-of-shape, middle-aged modeler can throw all afternoon without breaking his body!

A hint on charging these tiny (70 to 100 mA) battery packs: If you will slow-charge them at the 10-percent rate between flying sessions, you can get an hour or more of flying time on a single charge. I have flown for an hour and 15 minutes and still had about 25 percent of my charge left, according to my ESV. You can fast-charge from your car battery, but be careful—these are small cells. A fast charge seems to give about 40 to 45 minutes maximum. Another solution is to carry an extra slow-charged battery in your flight box. Well, that's about all I can think of—the Feather builds quick, so get building! Happy soaring. •