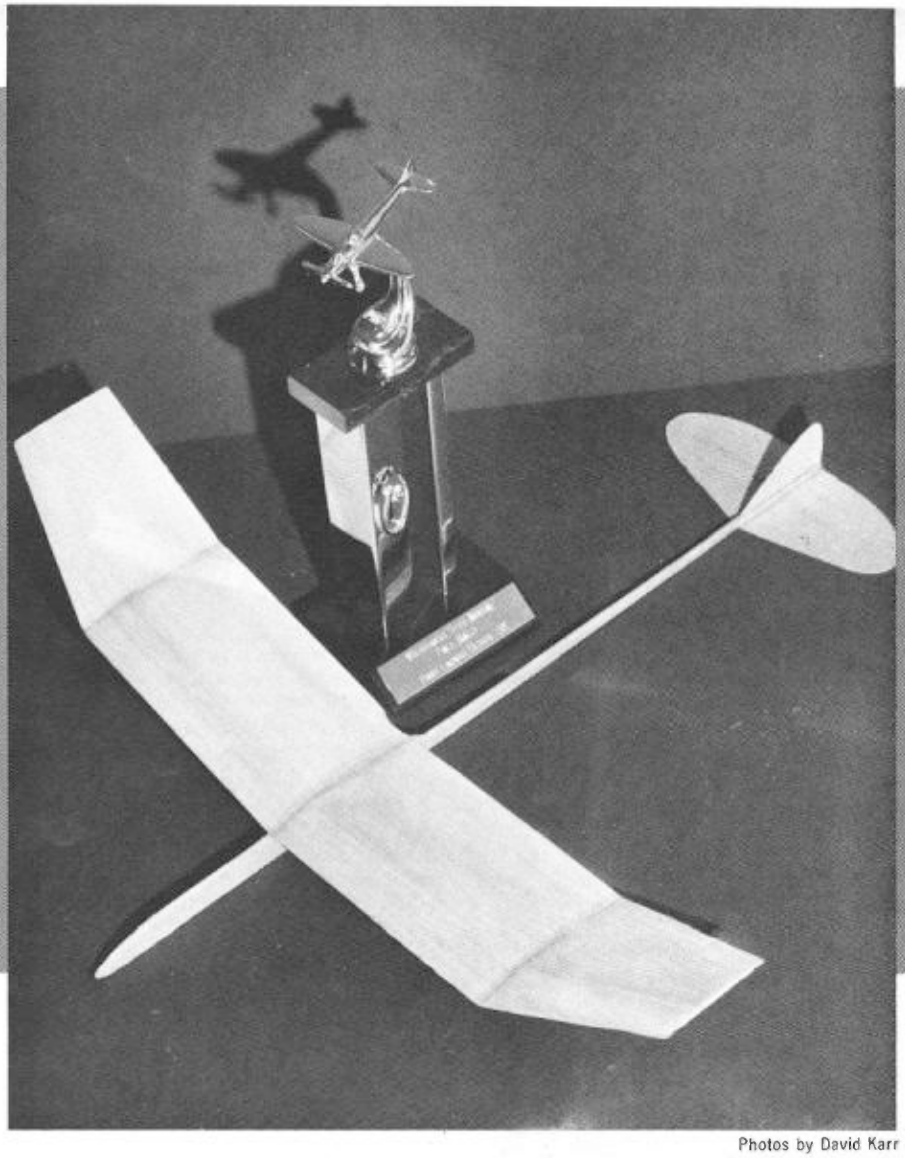
The "20/20"

by Larry Kruse



Photos by David Karr

The strangest game! Get a good Handlaunch design and you throw it away.

As all good Free-Flighters know, the two criteria for a winning airplane are a consistent altitude-grabbing power pattern and a hanging, thermal-sensitive glide. Whether gas powered, rubber, towline, or rocket, the means of achieving these two objectives vary considerably, but the objectives themselves remain the same. You have to get that altitude, and you've got to hang that glide.

The same maxim holds true for handlaunch gliders, as well. Although the max time for a Handlaunch is a minute less than many other classes, the method of achieving altitude is so lacking in efficiency that a two minute flight can be quite an achievement.

There are two schools of thought relative to how such an achievement comes about. One school suggests that you can afford to sacrifice some altitude in favor of a more sensitive glide. The other, personified by Fast Richard and his *"Flash"* design, proves that you can fudge on the glide a bit in order to attain altitude and still come out smelling like a rose. (Or do roses grow in Snider Swamp?)

Planes built in accordance with the first theory tend to have a large wingspan (20" or so), a relatively thin airfoil and a narrow chord. They ordinarily have a long tail moment with a small stabilizer which helps create a beautiful hanging glide. Such characteristics also contribute to the trickiness of a hard launch, which either gives you a magnificent soaring flight, or a "whump" into the ground at exactly 4½ seconds after launch due to transition problems.

Planes following the second theory tend to have a shorter span (17" to 18"), a thicker airfoil, a wider chord and a shorter tail moment. The stabilizer is large; transition from power pattern to glide is good. By and large the planes are easier to adjust with a greater consistency of flight pattern in evidence when subjected to a hard launch. They do, however, also have a somewhat faster glide coupled with a tendency to fly right through weak lift.

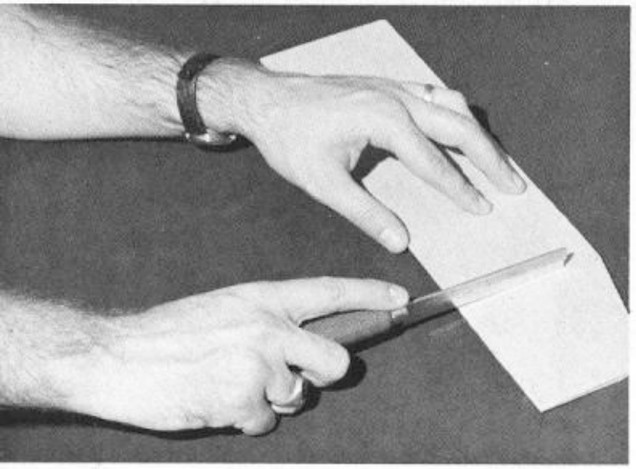
So, in effect, each design theory is a compromise of either altitude or glide characteristics.

For some time I had been flying two ships which had served me well. One was built in accord with the first theory and could be counted on either to beat 60 seconds in still air or bury itself to the leading edge, whichever it preferred at the moment. The plane was not vindictive—just indifferent as to whether it flew or not. It provided me with many exciting cross-country chases when it caught good air. It also provided me with an equal number of exciting boomerang-fashion kamikaze dives after a poor launch. A flying buddy of mine dubbed it the "Ruptured Duck." He said you either managed to duck or were in imminent danger of a you-know-what.

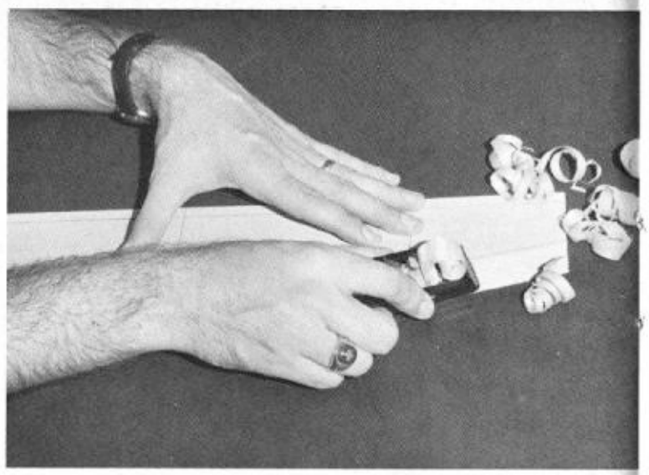
The other plane was set up according to the second theory patterned after Bill Blanchard's *"Polly,"* but differing in stabilizer area. It was unbelievably consistent regardless of the type of launch. On one occasion I was flying on damp grass in leather-soled shoes, (a definite no-no). When the inevitable slip occurred, I uttered a Charlie Brown, "Aauugh!" and tossed the glider almost straight up in the air as I crashed to the ground in a heap. The glider did 36 seconds. My inflight time was not as good.

The basic problem with this plane, however, was that it would not take advantage of light lift, but seemed to slice right through it. So I had two planes, both with theoretical compromises in order to provide assumed advantages.

At about this point in my association with HLG's, I became aware of the diamond airfoil's advantages of turbulation and ease of construction by building one of the Geraghty designed *"Driftwoulds."* Although the plane was a bit on the small side, the wing shape and airfoil showed some interesting characteristics—good



Accurately marking the dihedral breaks prior to shaping and sanding can be time-saving technique. A triangle or square can determine the angle.



The initial shaping of the leading edge is most easily accomplished with a good razor block plane. Adjust razor for an even, shallow type bite.

penetration, good transition, reliable launch patterns.

By combining certain aspects of the two planes previously mentioned with an enlarged diamond airfoil wing similar to that found on the *"Driftwould,"* I came up with the *"20/20"*. The name's doubly appropriate. Not only does it denote the span and fuselage length of the plane, but it also indicates the visual acuity needed to keep the plane in sight during thermal flights.

The Wing

Since I wanted to retain the stability and simplicity of the diamond airfoil section and at the same time enhance the glide over that of the *"Driftwould,"* the span was increased to 20" and the chord was widened slightly. It takes a little better arm to get it up to thermal altitude, but the glide hangs and hangs.

Begin construction by selecting good 4-6 lb. Sig contest balsa ¼"x4"x36". Sig's 4" taper sheets work well and minimize sanding. If you pick your wood carefully enough, and attempt to get sheets with matching weights, three wings can be made from two 36" lengths.

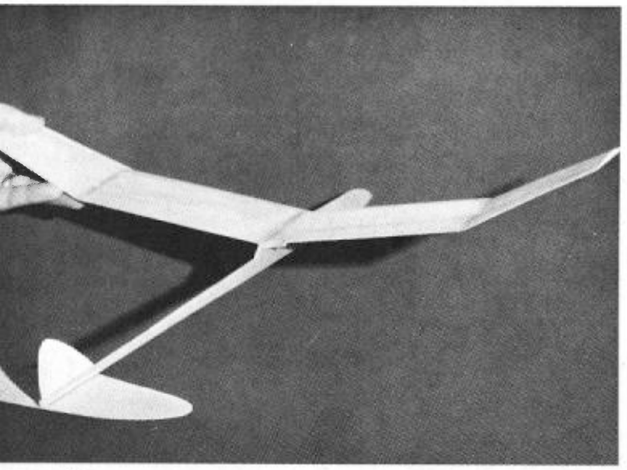
Cut out the wing shape and sand the airfoil into it after marking the high point one inch back from the leading edge. I always mark the dihedral and polyhedral breaks before sanding by shallowly cutting them into the bottom of the wing with a razor saw, a necessary tool for all glider builders. Taper the wing tips to approximately 3/32" thickness at the outermost high point of each tip. This taper is quite important in terms of centering the mass of the glider. Get rid of as much tip weight as possible. Use a razor plane or coarser grades of sandpaper for the initial shaping, but final sand the wing blank with 400 wet or dry paper.

Now cut the polyhedral breaks and block up the tips. Use Hobbypoxy Formula 4 (Quick set), using any excess that squeezes out of the joint as a fillet by smoothing it down with your finger. (Don't go away four minutes and then try to smooth it down, unless you need a glider permanently attached to your finger.) Treat the dihedral joint the same way, and you're well on your way to being finished.

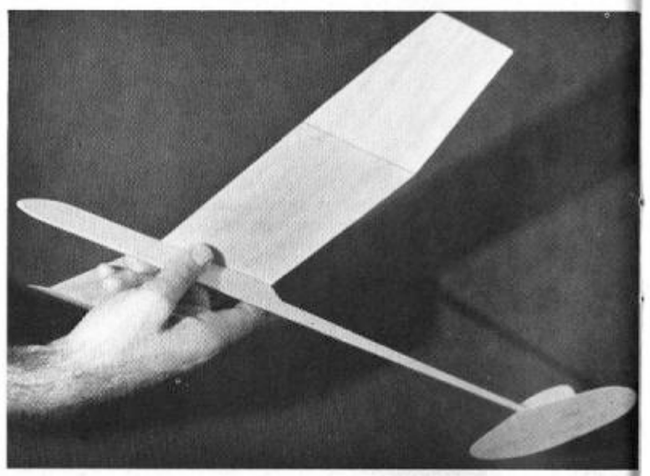
The Fuselage

The fuselage is cut from Sig ⅛"x¾"x36" spruce. I used ¾" width rather than ½" to lower the stab location relative to the wing for improved stability. Two fuselages can be made from one piece of 36" spruce by carefully positioning the pattern. Sand all surfaces smooth and round off all corners with the exception of the area to which the wing and stabilizer are to be glued. I ordinarily use about a ⅛" stabilizer tilt (high side to the left looking at the plane from the rear), so now would be a good time to carefully sand that angle into the stabilizer mounting area. Attach the snuffer tube and D/T weight bracket now with epoxy, if you desire, and you won't have to do it later.

Typical in planform, a competitive machine. A Handlaunch is a hotly contested Free-Flight event. The finger rest beneath the wing visible here.



You work very hard to build it and then try to throw it away. No wonder people can't understand what we're doing. Build several for practicing.



The Tail Group

The rudder and stabilizer are both cut from Sig 1/32" 6 to 8 lb. balsa for non-warping rigidity. If good 1/32" isn't available, sand down 1/16" to that size. Airfoil the stabilizer (top only) and the rudder (both sides). With the rudder placed as far aft as it is, be certain you get the airfoil symmetrical.

Final Assembly and Finish

The wing can now be glued to the fuselage. I've used both Tite-Bond and epoxy and each has worked equally well. Don't forget to add the ⅛" spruce finger rest after the wing-fuselage assembly has dried.

The tail group can also be added. Prop up the stabilizer to get the ⅛" tilt and make certain the rudder is both vertical and aligned straight with the fuselage. Use Testor's Fast Drying Formula A for the rudder and stabilizer since they will probably have to be replaced at least once during the life span of the plane.

To fill the wood before doping, swipe some of your mother's/sister's/girlfriend's/wife's (pick one, it's multiple choice) best talcum powder and sprinkle it on the top of the wing, rubbing it into the grain well with your fingers. Treat the bottom of the wing and the fuselage the same way.

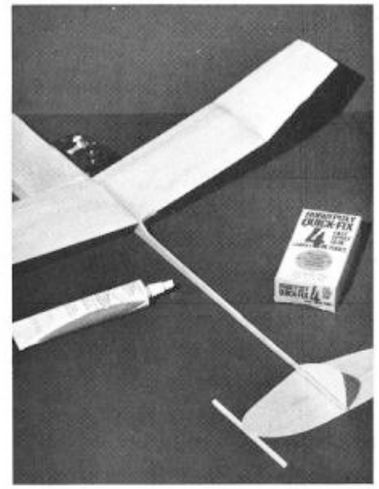
Tap the wing and fuselage gently to jar loose any excess talcum and brush on two coats of Sig Lite-cote thinned 50%. Sand everything off down to the bare wood and repeat the process two more times. I do not dope the tail section at all because of the danger of warping. You can now add any tissue trim and numerals that you prefer, and finally brush on two more coats of Sig Litecote. A good commercial grade of wax can be applied, but it does add some weight. The finished weight of the plane should be between 1¼ and 1¾ oz. Although I have one *"20/20"* that weighs out at 1⅞ oz. and flies well, its a real "oinker" in calm or near calm conditions.

Flying

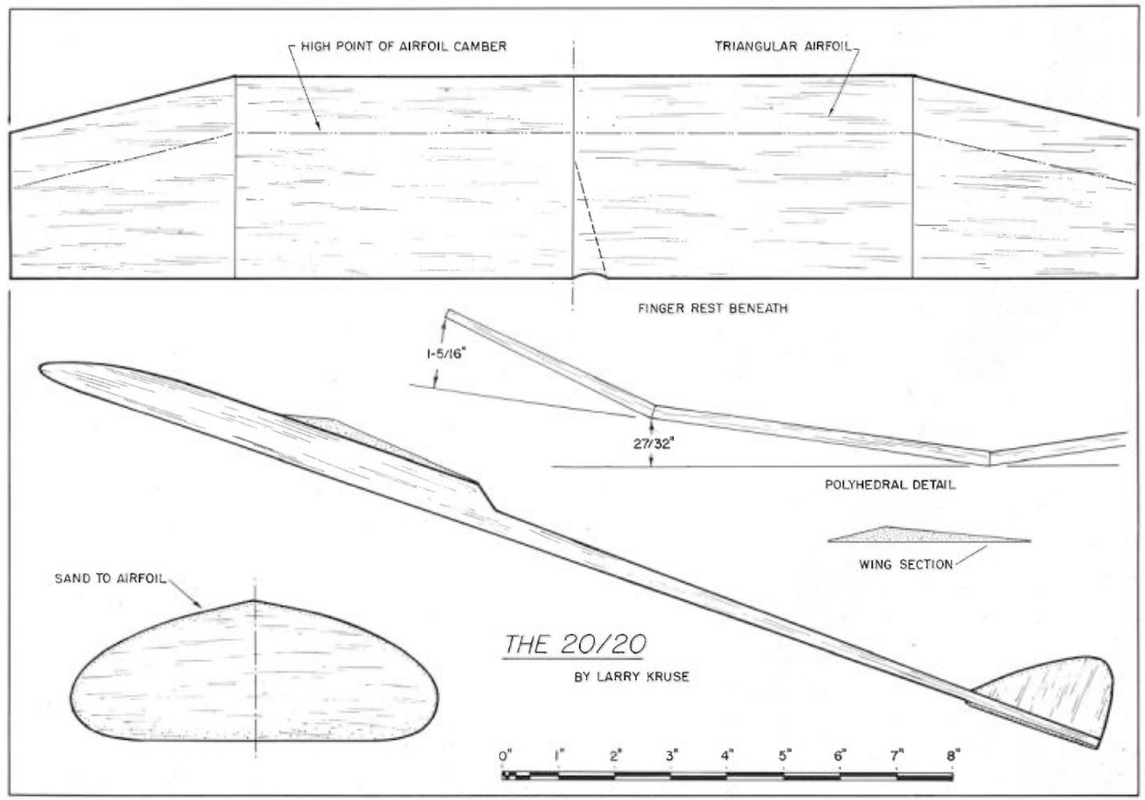
The *"20/20"* trims out with C.G. at 50% of the wing chord. Add clay until that balance is attained. Any diving or looping tendencies can be corrected by gently warping the trailing edge of the stabilizer. If any tendency to spin out of lift is encountered, warp the trailing edge of the left wing panel down to hold the plane in the glide path.

Launch the plane into the wind at a right bank of approximately 30° in an upward trajectory of approximately 60°. The ship should climb out and level off about 180° downwind from the point of the launch, nose up and headed into the wind. If it seems to want to run down wind, increase the tilt of the stabilizer by twisting the rear of the fuselage.

During the past season the *"20/20"* was entered in three "AA" and "AAA" contests, winning two first place trophies. I attribute the failure to place in the second contest more to my error in launch (destruction of one plane); bad luck (O.O.S. after dethermalizing) and stupidity (panicked myself into throwing into bad air); than to any flaws in the design. Properly trimmed the plane is a consistent threat in any contest. Good luck with yours.



The final rigging. The stabilizer is blocked up to give it ⅛" of tilt in relation to the wing.



FULL SIZE PLAN AVAILABLE THROUGH CARSTENS FLYING PLANS