

Random Notes on Hand Launched Gliders

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It is shamelessly reproduced here.*

Do not use a large stab or rudder. If the model is too stable, it will not make the transition quickly and without altitude loss. In hand launch, the transition is everything. If the stab is too large it will tend to let the plane fly even though it is really badly out of longitudinal (fore and aft) trim. You will wonder why adjusting the stab does not bring better flights, when the glider is basically out of balance. Too large a stab will keep the HLG from any snap recovery and the plane will fly through at the top of the launch. If too small, the stab will sink out at gliding speeds because some weight is carried by it. The stab should be tapered from the center outwards to approximately $\frac{1}{32}$ " at the tips. The stab leading edge may be relatively blunt. You do not want a stab that over lifts. Some people prefer a wing airfoil with a thin section and a high point 40% back from the leading edge. This type of section has less drag than a thicker wing section, but will result in a faster glide and less stability. A thicker section with a high point 25% to 30% from the leading edge may have slightly more drag, but also a better glide and will be more stable, especially in windy weather.

In general, the rudder is too effective at high speeds, and not effective enough at low speeds. The solution is to use stab tilt for the glide turn, keeping just enough rudder for a transition.

Offset the centerline of the wing $\frac{1}{16}$ " to the left of the centerline of the fuselage.

Cut out the fuselage slightly over-size to allow for stress relief in the tail boom area, then sand it down to the final shape.

Arrange the wing so that the heavier panel is on the inside of the glide turn. Put built-in wash-in in the tip of the inside panel. The wash-in does two things; it makes the panel stall first, dropping the model into the core of the thermal, and it keeps the plane from spiraling too tightly once it is in the thermal.

Resist the urge to make rounded edges on the fuselage! Rounding saves very little weight but seriously diminishes strength.

Before the last coat of dope on the stab and fin, apply a strip of lightweight Japanese tissue to the rear half of both sides of the fin. Also, apply a $\frac{3}{4}$ -inch wide strip of tissue to the rear of the stab; top only on the left, and bottom only on the right. Apply the tissue with thinner. These tissue surfaces will be much easier to adjust later for flying trim. Use white glue for attaching the stab so that it may be easily removed for adjustments. John Oldenkamp, on his ZWEIBOX, tapers the $\frac{1}{4}$ " balsa fuselage on the right side only to approximately $\frac{3}{32}$ " X $\frac{1}{8}$ " at the extreme aft section. This taper, plus the airfoil fin (flat on the left side, gives an automatic left turn. John glues the fin onto the side of the fuselage instead of on top.

Bias-cut the finger rest from $\frac{1}{4}$ " X 1" trailing edge stock. The grain ends up in the proper direction and will take very little work to finish.

The POLLY uses built-in rudder offset, $\frac{1}{8}$ " over 14.5" or 0.5° . The POLLY does not use stab tilt. POLLY does not fly 0-0, but uses some incidence in the stab as a margin of safety of an off-launch. The BLACKJACK design by Larry Sargent also mentions incidence as one of the best kept secrets in HLG flying; it helps in the rollout and helps to avoid the straight up/straight down flight patterns. Use $\frac{1}{32}$ " to $\frac{1}{50}$ " of incidence at the wing leading edge.

Tom Peaden (U.S.KID) recommends that the stab be 1/2" below the level of the wing. He can't give a good aerodynamic reason, but it has been proven over and over when he didn't adhere to it.

Kit Bays uses a semi-symmetrical airfoil on heavier, windy weather HLGs. This type does not glide very well in still air, but it gives penetration and stability in the wind.

Control glide turn with the stab tilt.

Control climb pattern with rudder.

The four basic requirements for HLG: A rearward center of gravity and zero decalage (no incidence in wing or stab) gives a loop free launch. Slight left rudder provides launch turn. Stab tilt for left glide turns. Washing in left wingtip prevents spiral dives.

When a hand launch goes straight where you point it, and then fails to make a transition, it is only a tweak of up elevator away from perfection.

If the plane turns too tightly in the glide, stick some clay on the right wing tip and check the alignment of the rudder.

If the model tends to climb in a wide, flat circle, you can probably counteract this by warping the trailing edge of the stab down, warping a slight part of left rudder, and throwing with more of an overhead motion.

Basic safe trim: Left glide turn in stab tilt, wash-in of the left main wing panel, slight left rudder. May also skew the wing, right wingtip forward, to help the left-turning transition. Similarly, offsetting the wing (about .06") to the left helps save tip weight and bending.

Bend wash-in into the left wing progressively from none at the wing root to about 1/16" to 3/32" at the polyhedral break (none at the tip). Bend in equal amounts of "up" on both sides of the stab until the glider has slightly stalling glide. Put in enough stab tilt to give a hint of left turn when hand gliding. Properly trimmed, the glider will do a 220° to 270° climbing turn, and then drift gently into a left glide turn. Having the model pointing downwind after the transition will help keep the glider from stalling as its airspeed decreases. You may notice that planes that transition facing wind tend to stall and lose altitude, especially if it is windy. Having a downwind transition will also allow you to wait longer before throwing into a thermal.

Symptom: Instead of spiraling around in a smooth climb, the HLG just slow rolls in a more or less straight line. Problem: The glider is shy on "up." Cure: Add more up in the stab (leave center of gravity as on plans). This will make it climb more quickly and roll more quickly. Take out stalling in the glide with stab tilt. An incorrect launch does not usually cause this problem.

Symptom: The model spirals around only about 90°, then wings level and the model noses up into a stall. Problem: The model was either thrown with too much bank or has too much "top" rudder. Cure: Take out left rudder and/or add more wash-in to the wing.

Bank the model less or launch more skyward. Sometimes more "up" may be needed. The glide circle may be readjusted with stab tilt if necessary.

Symptom: The model patterns very tightly or loops. Problem: The model has too much “up”, or was thrown with too little bank or too much skyward. Cure: Take out some up. Open the glide circle by backing off the stab tilt. Throw at a little lower grade or with a bit more bank (go easy). If the model has a tendency to spin in the glide, add more wash-in to the wing. If the model tries to spin in on the glide, add wash-in on the left wingtip. If the spin persists, reduce the left rudder tab. If the glider goes way up, does 180° vertical reverse, slams straight back to earth, then add more “up” to the right side of the stab.

Problem: The model climbs to the right, but stays in the bank too long and loses altitude, still in a banked attitude before leveling off and turning left. Cure: Too much decalage (angular difference between angles of attack of wing and the stab). Warp stab trailing edge down; or, warp right trailing edge of stab down and left trailing edge of stab up. A less preferred cure is to add more left rudder.

Problem: The model climbs straight or to the left and does a Dutch Roll: and, when you try to correct this by using a sidearm throw, the glider now banks sharply to the right and goes into a shallow banked climb. The glider seems to alternate between the two extremes. Cure: Fin is too small. Possibly, the glider has too much dihedral.

If the glider goes up in a proper spiral, then falls off at the top and stalls: difficult solution, but initially try a tweak more right tab at the bottom of the fin (ZWIEBOX) or a smidge more “down” on the left side of the stab.

If the glider does everything almost perfectly, but spins to earth at the slightest upset; maybe the CG is too far aft, but more likely the left wing panel wash-in is too shallow.

If the model pulls out of the initial right bank, goes vertical and tends to barrel roll to the left and possibly runs out of oomph upside down, then tweak a little “down” into the right side of the stab.

The following trim scheme is from the CHALLENGER article and could be used as a starting point. It should produce a launch pattern almost vertical in attitude, with a slight turn, maximum altitude, and a flick-out transition on top. Before flying, set up the model as follows: Bend the fin to the left slightly (just bend the surface by squeezing the wood slightly between your thumb and finger, compressing the wood on the inside of the bend while stretching the wood on the outside). Bend the left side of the stab (rear) slightly down. Bend the right side of the stab up slightly more than the left side was bent down. The ZWEIBOX also uses this stab tweaking up/down. This contributes much the flick rollout. If the model stalls in the glide, add a little clay to the nose. If the model dives (it shouldn't if you bent the stab up enough), bend the right side of the stab up a little more.

If the model sweeps over on its back on the launch, there is too much up on the right side (or not enough down on the left side). Throw again and adjust until the model is going almost straight up. If there is not enough left rudder, the model will go too much to the right and have a very wide glide circle. The model has to go slightly to the right on launch to get a proper transition. Too much wash-in in the left main panel will lift the wing on launch, making transition difficult and increasing the glide circle. Keep adjusting the stab and rudder to control the launch; add or remove nose weight to control the glide. A full-power launch is almost vertical at 75° to 80° with slight tilt to the right, and almost overhand. If it is launched too near the vertical, it will come over backwards with usually poor transition. If the model, on a proper launch, sweeps back or even loops near the top, this means too much up-bend on the right side and/or increase the down-bend on the left side. If the model comes into the transition a little shaky, makes a fast run, and loses a little altitude before settling into its proper glide, it can usually be corrected by any or all of these adjustments: Bend the

right stab up a very small amount, decrease the down-bend on the left stab slightly, remove a small amount from the wash-in, or reduce the left rudder bend slightly.

An alternative trimming scheme is a little bit of wash-in in the right inner wing panel, stab tilt for a left glide, and a bit of right rudder tab to prevent the model from spinning in when in a thermal. This technique is used by Martyn Cowley (GOLDRUSH). Martyn says that it may sound like a spiral dive waiting to happen, but that it is great for trimming the throw part of the climb—just like a power model, rolling left while turning right.