Basics of design and trimming a boost-glider or rocket-glider

by Kevin McKiou

1. Make the dihedral 15 degrees!!!! In 1994 I had prototype which just would not trim out. It did death dives. It would go inverted at the top of the hand launch (HL) and go inverted into the ground. It did all kinds of crap I could not figure out. The dihedral was set at 12 degrees, which was plenty for spiral stability, but not enough to make it really stable in the transition on a HL. All I did was increase the dihedral to 15 degrees. After that, it was easy to trim. It would roll out like a champ at the top of the HL.

2. Make the distance between the wing 1/4 chord and the tail 1/4 chord about 50% of the wing span. This will be adequate for spiral stability, but not excessive.

3. Make the horizontal stab area between 15% and 20% of the wing area. When I have gone below 15% I have had problems with excessive elevator deflection required. Anything above 20% is unnecessarily draggy.

4. Make the vertical fin area half the horizontal stab area.

5. If you can calculate the neutral point, set up the CG so the glider has a 15% static margin as a starting point. If this works out, fine. It is probably close to the safe minimum. If you can't calculate the static margin, start with the CG at about 40% back from the leading edge at the wing root.

6. Trim the elevator so the glider *just* will not fly in a straight line without stalling, no matter how slow you throw it. Remember to always toss it at a point on the ground about 20 feet in front of you.

7. Now you want to induce a turn. Add about 10 degrees of horizontal stab tilt to the right to induce a left turn. Add about a half gram of clay to the left wing tip to get the turn started. Give it another slow toss slightly down. If it glides into a left turn that is pretty flat, you are very close to perfect. If it turns too fast, remove to tip weight. If it won't break into the turn, add a touch of left rudder.

8. Time to throw it. Throw it up at about a 60 degree angle and tilted slightly to the right. It should arch up, go briefly inverted at the top and roll out in the opposite direction from which you threw it. Give it a real firm throw.

If it kind of slid up and did not arch back, you have the CG too far back. Add half a gram of clay to the nose and go back to step 6.

If it definitely looped back on you, try again with a throw that is a little more horizontal. If you just can't get much height because it wants to loop back (usually into the ground), the CG is too far forward. Remove a bit of nose weight and go back to 6.

If it seemed to launch OK and pretty much stalled at the top with a really slow roll out, add just a bit more weight to the left wing tip and/or a touch more left rudder.

9. The glide after HL should be a big gentle circle to the left. If you are not getting a turn, but the launch looks good, give it a bit more left rudder. That should help it into the turn. If the model tends to glide too fast in the turn, add a bit more up elevator. If it seems you just can't get everything working quite right between the launch and the turn (e.g., glides fine, but wants to loop on HL) add wash-in to the left wing tip. That is, bend the trailing edge down on the outter 1/4 of the left wing. Now, as the speed builds, the lift of the outer portion of the left wing increases more than the rest of the wing and forces it to straighten out the glide a bit, slowing it down. As the model slows, the wing tip weight and rudder will tend to turn the model back into the turn. Now you can back off a bit on the elevator. Use this sparingly. You can over do it and cause the model to tip stall. If the glider builds speed as it glides, with no real recovery in a second or two, the CG is very likely too far back. Add a half gram of clay to the nose and go back to 6.

That's about it. From this point, you will just have to try it, varying each of the parameters to get a feel for what works well. If you work this well, you should get very good hand launches and transitions to glide.