TEN-STEP TRIMMING PROCESS FOR RUBBER MODELS

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As published in the March/April and May/June 2005 Issue of The Flying Aces Club News,
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Trimming This is a topic that gets beaten to death and I'm sure that the method presented here will open a flood of comments. I will say this method has worked for me quite well for some time and allowed me to save many a model from trimming disaster. It can be used for any type of model from No-Cal to Jumbo Scale. (Ed Note: As well as endurance models of all types) The important thing to remember is not to skip any steps and to follow them carefully and patiently. Do not go on to the next step until you have met the requirements of that step. THERE ARE NO SHORTCUTS BUT THIS METHOD DOES WORK!

There are two concerns with trimming that must be satisfied; CG and thrust line. The CG of the model must be located at the right location to provide stable flight and provide maximum aerodynamic efficiency. A CG that's too far forward spells loss of aerodynamic efficiency. A CG that's too far aft spells stability problems. The thrust line determines how the model will be pulled (or pushed) through the air. Many modelers try to juggle each of these two problems at the same time causing unnecessary trimming confusion. The trimming procedure presented separates the two variables and treats them individually. You first get the most efficient "glider" you can with compromises allowed for free flight stability, then power the "glider" and adjust the thrust line. It's actually nothing new. I hear it's basically the same method utilized by rubber scale modeler Mike Midkiff. This does have a few differences from other methods I've seen and allows a logical progression towards a trimmed, stable flying model.

We will assume that your model has been built straight and true. Take the time to check this. I won't go into details on how to do this, but make sure you have no warps. This method of trimming also assumes the model has the right amount of dihedral and that all flying surfaces are of adequate size but does have some leeway to compensate for this since it checks stability. Your model will also need a way to adjust the stabilizer incidence. Here are the steps for trimming. Each will be discussed in the text that follows.

No-Nonsense Trimming

1. Locate CG.
2. Balance model without prop and motor to locate CG.
3. Glide model.
4. Adjust stabilizer for a smooth glide
5. Check stability by launching into slight dive and climb.
6. Readjust CG for stability if necessary.
7. Mark location of the new CG (if changed in step 6).
8. Install prop/motor and rebalance to established CG.

9. Test fly under power.
10. Adjust flight pattern with thrust line.

There you have it. Ten easy steps to successful free flight. Perform each step and your model will fly. Let's look at each step in detail.

1. Locate CG If the plan you are using shows a CG location, then start there. If the CG location is not known, then guesstimate the CG. Thirty percent of wing chord for a constant chord wing is a good place to start. Step 6 may adjust this later.

2. Balance model w/o prop and motor to located CG What?! Without the prop. You gotta be kidding! Nope. Leave the prop off! Have you ever seen people trying to test glide a ship with the prop on? One toss goes into a stall, one toss goes into a dive, next toss looks OK. The problem is that it's difficult to get a free wheeler up to a consistent speed that would be similar to when the model is flying at a consistent glide speed. One toss might have too much RPMs which means the ship is being launched at too great a speed to give realistic, usable results. The model will be much easier to glide without the prop. Oh, I hear you theorists out there, the spinning freewheeling prop contributes to drag so will affect the glide. Waa, waa, waa. DON'T WORRY ABOUT IT! Glide the ship at best L/D and when the prop is added it will bring the ship into the best sink rate portion of the polar curve (that was for all you theorists, the rest of you who just want to get your models to fly just ignore that). So leave the prop off for now so we can establish CG/decalage. Remember? One thing at a time!

3. Glide Model Of course this is the easy part. Now you have a glider so glide it! Launch the model smoothly towards an imaginary spot somewhere out in front of you on the floor. If you're working on a small, light model such as a No-Calory Peanut, this can be done right in your living room (if the wife will allow it...and don't hit the dog). The trick is to launch the model at it's glide speed. Do it a number of times to get the hang of it and to get some usable information on the gliding flight characteristics. If the model is turning then you have a warp! Slight amounts of turn are OK but hard turns must be tracked back to a warp and eliminated.

4. Adjust stab for smooth glide At this point the glide is adjusted using only the stab. DO NOT CHANGE THE CG BY ADDING OR REMOVING CLAY! The most efficient method for stab adjustment is to re-glue the stab with positive or negative incidence. Cement-type glues work great for this since the joint can be unglued with solvent and re-glued. Adjustable elevators can be used, but produce more drag. Take your time to obtain a smooth but not too floaty glide (best L/D not best sink rate theorists).

5. Check stability by launching into slight dive and slight climb This is the tricky step that requires some patience. If you are using a CG from a plan location then you might be able to skip this step, but it's worth checking. This idea came from flying R/C sailplanes. A neutrally stable sailplane can be put in a slight dive and will remain in that dive at constant speed. An unstable

sailplane when put in a dive will not stay in the dive, but will return to it's original attitude. This is all based on center of lift and CG location. I'm not about to attempt a lesson in aerodynamics (theorists) but I hope the idea comes across for these trimming purposes. Ideally, for maximum performance, neutral stability may not be the best way to go. Some amount of stability is desired because of the possibility of being upset during free flight (i.e.: air, ceiling, wall, other models, etc.) The closer you get to neutral stability, the more you'll get out of your model, but you'll sacrifice this stability. So glide your model and experiment with dives. The model should gently pull out of a dive. If forced into a dive, it should easily recover. If it doesn't, then it's time to move the CG!

6. Readjust CG location for stability if necessary. For a model that seems to stay in a dive add nose weight and negative stab incidence (leading edge lower). For a model that acts like a falling leaf or is overly stable (pulls out from a hard dive) remove nose weight and add positive stab incidence (leading edge higher). Continue gliding and adjusting until satisfactory results are obtained. Avoid TOO much stability.

7. Mark location of New CG (if changed in step 6) Easy enough. This is your permanent CG for your model! From this point on, you will not change this!

8. Install prop/motor and rebalance to established CG You might want to start with a bit of downthrust as most models seem to require some. Also, some side thrust. Which direction? This depends. In fact, of all the steps in this trimming method, this is the one most difficult to call. First, which way do you want to turn? Most indoor flyers try to turn to the left. Torque plays a big part in this decision. I have been flying many of my models with what would be considered small props and/or low pitch. This has provided many benefits. Problems with torque are almost nonexistent. Small props turn at higher RPMs and use smaller size rubber. Smaller size rubber means the model is carrying less weight and flying at a lower wing loading. I agree that for maximum performance and duration a large prop is the ticket. But why struggle? Start with a small prop. As an example, my 24 inch span Cessna C-34 is flying with a 6 inch Peck plastic prop and a very long loop of 3/32 rubber. Performance is great! (it flies to the right!) Unless you're heading for the NATs, start with a prop 1/4 to 1/3 the wingspan of your model. So with a smaller prop use a touch of down thrust and left thrust. Rebalance the model to the CG you have established.

9. Test fly under power Crank'r up and let her go. Start with just a few hundred turns. Rubber size is a separate topic that will not be discussed here. Just remember to check the CG after changing the motor. Observe the flight. Does it turn? Does it stall or dive? Remember how it looked when you were gliding it? What's different now? Ideally, the model should simply have an extended glide with a slight turn in the direction you desire. If everything looks good, try more power. Otherwise....

10. Adjust flight pattern with thrust line Adjust powered flight through the following adjustments:

stalling - add down thrust
diving - add up thrust
excessive right turn - try small amounts of left thrust*
excessive left turn - try right thrust*

All models will require varying amounts of thrust line adjustment. Some none at all. Some excessive. Whatever you do, AVOID REMOVING OR ADDING CLAY! Small amounts may have to be added to compensate for the propeller drag, but if you're using a smaller prop as suggested, then clay will not solve your problems. Look at the thrust line.

Phew! So there you have it: Please give it a try with your next model or if you have one of those pesky models that just doesn't want to fly, take it back to Step One. THIS DOES WORK and really is a simple method for trimming. I don't consider it a cure-all, but you'll be pleasantly surprised at the results. I would appreciate any comments of feed back on this method and would like to hear from any of you.

*these may not provide a correction to the problem and may require modification of the model fin area.