TRIMMING

This is a topic that gets beaten to death and I'm sure that the method presented here will open up 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 fro any type of model from No-Cal to Jumbo Scale. The important thing to remember is not to skip any steps and to follow them carefully and patiently. Do not go onto 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 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 stab incidence. Here's the steps for trimming. Each will be discussed in the text that follows.

NO-NONSENSE TRIMMING

- 1. Locate CG
- 2. Balance model w/o prop and motor to located CG
- 3. Glide model
- 4. Adjust stab for smooth glide
- 5. Check stability by launching into slight dive and slight climb
- 6. Re-adjust CG for stability if necessary
- 7. Mark location of new CG (if changed in step 6)
- 8. Install prop/motor and re balance to established CG
- 9. Test fly under power
- 10. Adjust flight pattern with thrust line

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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 guesstamate 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 not have enough RPM and will provide additional drag and stall the model. Another 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 test glide without the prop. Oh, I hear you theorists out there, the spinning freewheeling prop contributes to drag so will effect 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! <u>3. Glide Model</u>

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 your working on a small, light model such as a No-Cal or 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 reglued. 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 a constant speed. A unstable sailplane when put in a dive will remain in the dive and speed up. A stable 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 is desired. Of Course, for a free flight model, 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. (ie air, ceiling, wall, other models etc.) The closer you can 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 in to a stall it should easily recover. If it doesn't then it's time to move the CG! <u>6. Re-adjust CG for stability if necessary</u>

For a model that seems to stay in a dive add nose weight and negative stab incidence.(leading edge low) For a model that acts like a falling leaf or is overly stable(pulls out hard from dive) remove nose weight and add positive stab incidence.(leading edge high) 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 re balance to established CG

You might want to start with a bit of down thrust 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 which is the 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. The Editor has been flying many of his models with what would be considered small props and/or low pitch. This has provided many benefits. Problems with torque are almost non-existent. 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 and left thrust. Re-balance 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 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 *

MARCHARD STREET

*these may not provide a correction to the problem and may require modification of model fin area. See "Jack and Jane" by Bill McCombs further on in the newsletter.

All models will require varying amount of thrust line adjustment. Some none at all. Some excessive. What ever you do, AVOID REMOVING OR ADDING CLAY! Small amounts

may have to be added to compensate for the propeller drag but if your using a smaller prop as suggested, then clay will not solve your problem. Look at the thrust line!

Phew! So there you have it. Please give this a try with your next model or if you have one of those pesky models that just doesn't seem to 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 or feed back on this method and would like to hear from any of you who attempt to trim using the ten steps. I would like to streamline this write-up and have extra copies available for new flyers at TMJHS to help them with trimming problems so your input is important!

PILOT BONUS FOR FAC SCALE?

Once in a while I read of modelers demanding pilots be required for scale models. Pilots do add a lot of zest to models especially those open cockpit jobs. Of course it wouldn't be fair to require all model builders to whittle up a bust of Wilbur for ever one of those scale jobs. I hate to complicate things but why not award bonus points for a pilot? A 5 point bonus could give the beginner scale builder an edge over another high winger by allowing his high wing job to carry a pilot. Scale judges could have final say on how realistic the pilot must be in order for the points to be awarded. No profiles and no ping pong balls but no Michelangelo's David either. (with clothes on) This sounds like an easy inclusion into the FAC rules for scale bonus points. Any comments guys or FAC GHO? Or has this been tried before?

HELLLOOO JACK AND JANE!

Al "Grayhawk" "Floats" Lawton passed along this great bit from an old Flightmasters Scale News and Views newsletter that goes along great with the Ten Step trimming program presented in this issue. Make a copy and keep this in your flight box! (along with the ten steps of course!) This cute thing covers just about everything imaginable! This guy McCombs makes a lot of sense! Interestingly enough, some of the problems cited are avoided with the Ten Step program.



DE HAVILLAND The D.H.5, with 110-h.p. Le Rhone rotary, was a low-altitude fighter. Backward stagger gave unexcelled forward vision.

A FFS Primer, featuring Jack and Jane By Bill McCombs

See Jack making his model glide well. Now see Jack's model stall in powered flight. See Jack adding weight to its nose. See Jack's model flying well. Now see it diving down in the glide! See Jack starting to burn his model! Quickly, Jane, tell Jack about downthrust!

See Jack making his model glide well. See it flying well in powered flight. But see the downthrust, 20 degrees! See Jack scowling and striking a match! quickly, Jane, tell Jack to move the c.g. aft and start over.

MHAWK ADDS: FOR CURING DUTCH POLL (MODEL FUES See Jack making his model glide well. See the model dive in powered flight. See Jack remove a little downthrust. See the model looping! See Jack putting back a little downthrust. See the model dive! See Jack fumbling for his matches! Quickly, Jane, tell Jack to move the c.g. forward a little and start over.

See Jack's model starting upward fine! Now see the spiral dive to the left! See Jack adding right sidethrust. Now see the spiral dive to the right! See Jack adding a little left sidethrust. See the spiral dive to the left! See Jack picking up a sledge-hammer! Quickly, Jane, tell Jack to cut off a little fin area!

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Ś See Jack smiling! See Jane smiling! See happy Jack and OJ Jane. See their hobby - See Jack and Jane collecting rockel