Pattern Trimming chart by Mike Walpole

This chart was set up for trimming a pattern plane. However, there are quite a few sport aerobatic planes that would fly better if they were set up like pattern planes. It's a lot easier to fly a plane that's properly set up than a plane with all kinds of perverse mixing. I also must give credit where credit is due, this chart comes from the NSRCA (National Society of Radio Controlled Aerobatics) newsletter and was submitted by Mike Chipchase of Australia. Some of this information is repeted from the last article on trimming for aerobatics.

First let's talk about basic airplane setup. The latest pattern designs are set up with 2.5 degrees of right thrust, 0 degrees down thrust, .5 degrees positive incidence on the wing (root and tip, no washout), and 0 incedence on the stab. Or, .5 $\sim$ 1 degree downthrust and 0 incedence on the wing. Use an incedence meter to check this, or block the plane up on a big flat table and use a scale accurate to 1/32nd of an inch. If the plans show this information use that as a starting point.

Control throws should be set up as shown on the plans. It's very important each aileron to have the same throw. This should be setup mechanically. The aileron throws should be set up the same up and down. If the plane has split elevators make sure that each elevator half has the same throw as the other half. I usually set the plane up with more down elevator than up elevator. That way I'll have the same control authority for up or down elevator. Set up the rudder with about 30 $\sim$ 35 degrees of throw. Of course the ailerons and the elevator need to be gap sealed.

To start out, the CG should be placed as shown on the plans, or about 30% of the average chord. The CG can be adjusted later. Use the placement of the radio to place or move the CG if possible. This is better than adding unnecessary weight because light airplanes fly better than heavy ones. Since the battery pack is the heaviest part of the radio, its placement will have the biggest affect on the CG. Also, laterally balance the plane. Pick it up underneath the center of the spinner and underneath the center of the tail. Place weight on the light wing tip until the plane balances. Embed the weight in the wing tip.

With all that in mind heres the chart.

To test for	Test procedure
Observations	Adjustments
Control Neutrals	Fly model straight and level
Trim for straight and level	Adjust clevices to center transmitter trims.
Control throws	Fly model and apply full deflection of each control in turn.
Check the response of each control	Aileron Hi-rate 3 rolls in 4 sec. Lo-rate 3 rolls -n 6 sec. Elevator Hi-rate to give a smooth square corner. Lo-rate for a loop of 130 ft. diameter. Rudder Hi-rate for stall Lo-rate to maintain Knife edge flight.
Decalage (incidence)	Power off vertical dive, cross wind any. Release controls when model vertical.
A. Does model continue straight down B. Does model start to pull out (nose up) C. Does model tuck in (nose down)	A. No adjustments B. Reduce incidence C. Increase incedence
Center of gravity	Roll model inverted
A. Lots of down elevator required to maintain level flight. B. No down elevator required to maintain level flight or model climbs.	A. Add weight to tail. B. Add weight to nose.
Tip weight, course adjustment	Fly model straight and level upright Check aileron trim maintains wing level. Roll model inverted, wings level. Release aileron stick.
A. Model does not drop a wing B. Left wing drops C. Right wing drops	A. No adjustment needed. B. Add weight to right tip. C. Add weight to left tip.
Side thrust	Fly model away from you into any wind Pull into a vertical climb (watch as the plane slows down.)
A. Model continues straight up B. Model veers left C. Model veers right	A. No adjustment needed. B. Add right thrust. C. Reduce right thrust.
Up/Down Thrust	Fly model on normal path into any wind. When model is straight out from you about 100 meters away, pull into a vertical climb and release the elevator.
A. Model continues straight up B. Model pulls to canopy (up) C. Model pulls to belly (down)	A. No adjustment needed. B. Add down thrust. C. Reduce down thrust.

Tip weight, fine adjustment	Fly the model away from you into any wind and pull into a small diameter loop.
A. Model comes out wings level B. Right wing low C. Left wing low	A. No adjustment needed. B. Add weight to left tip. C. Add weight to right tip of remove from left tip.
Aileron differential	Fly model on a normal pass and do 3 or more rolls.
A. Roll axis on model centerline B. Roll axis off to the same side of model as roll command. C. Roll axis off to opposite side of model as roll cmd.	A. Differential OK B. Increase Differential C. Decrease Differential
Dihedral	Fly model on normal pass and roll into knife edge flight. Maintain with top rudder (do this test to the right and left sides)
A. Model does not roll out of knife edge. B. Model rolls in direction of applied rudder. C. Model rolls opposite the rudder in both tests.	A. Dihedral OK. B. Reduce Dihedral C. Increase Dihedral
Elevator Alignment.	Fly model straight away into any wind. Pull into an inside loop. Roll inverted and push into an outside loop.
A. No rolling when elevator applied. B. Model rolls in same direction in both tests. C. Model rolls in opposite directions in both tests	A. Elevators correctly aligned. B. Elevator half misaligned. Raise half or lower the other. C. One elevator half has more throw then the other. (Model rolls to the side with the most throw.) Reduce the throw on one side or increase it on the other side.
Pitching in knife edge flight	Same as dihedral test.
A. No pitch up or down B. Model pitches up (to canopy) C. Model pitches down (to belly)	A. No adjustment needed. B. Alternate cures. 1. Move the CG aft. 2. Increase the wing incidence. 3. Drop the ailerons. C. Reverse the above

Notes: Trimming must be down in calm conditions. Make mutiple tests before makeing any adjustments. If any changes are made go back over the previous steps and readjust as necessary.

Well, there it is. For the purists out there you might note that none of these adjustments require the use of a computer radio. A well designed, well built aerobatic plane can be set up very close to perfect without any mixing. In fact that is one measure of a well designed pattern plane.

I hope this helps any one out there that is interested learning advanced aerobatics.


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