NSRCA's Aircraft Trimming Chart

These tests assume that the plane has been built perfectly aligned, wings square to fuse, stab in line with wings, vertical fin is exactly 90 Deg. to horizontal stab. Thrust, incidence, and balance (CG) are set according to the designer's recommendations. The wings are not warped as checked with an incidence meter, and the elevator halves are moving together as checked by a "Throw Meter".

These flying tests should be done in near calm conditions. Double check each of the following tests before making any changes. The most critical component of aircraft setup is finding the proper Center-of-Gravity. It must be correct for each airplane, regardless of differences due to building variables and weight. Because of this requirement, it is important that this trim chart be followed in the order in which it is written.

Test for	**Procedure**	**If The Results Are:**	**Make This Adjustment**
A. Control Neutrals	Test response to each control.	Adjust trims for straight & level flight	Adjust clevises to center TX trims
B. Control Throws	Apply full deflection of each control.	Check for response; Aileron hi rate 3 rolls in 3 secs. Elevator, square loop corners Rudder, 35 to 40 Deg.	Change control horns, ATV, and Dual Rates as required
C. Center of Gravity #1 (see Note A below)	Roll into a vertically banked turn.	Nose Drops	Add tail weight
		Tail Drops	Add Nose weight
D. Center of Gravity #2 (see Note A below)	Roll into inverted flight.	Down required to hold level flight	Add tail weight
		Up elevator needed to hold level flight	Add Nose weight
E. Up/Down Thrust #1	Fly model straight and level, then cut throttle. (Note: Any change requires re-running Tests G, K, and L)	Model continues level with a gradual drop	None
		Model abruptly dives	Increase down thrust
		Model abruptly climbs	Reduce down thrust
F. Up/Down Thrust #2	Fly model straight & level, then pull up. (Note: Any change requires rerunning Tests G, K, and L)	Model continues straight up	None
		Model pulls to canopy	Increase down thrust
		Model pulls to belly	Reduce down thrust
G. Decalage or Angle of Incidence	Power off vertical dive from high altitude (neutralize elevator) (see Note B below)	Model continues straight down	None
		Model pulls to canopy	Increase wing or stab incidence
		Model pulls to belly	Reduce wing or stab incidence
H. Knife Edge Pitch	Fly model on normal pass, roll to knife edge left, use rudder to hold model level. Repeat for knife edge right.	Model does not change pitch	None
		Model pitches to canopy	Either move CG aft; or increase wing incidence; or mix down elevator with rudder
		Model pitches to belly	Reverse of above

Test for	Procedure	Results	Adjustments
I. Tip Weight #1	Fly straight and level, roll inverted, release aileron stick.	Model does not drop a wing	None
		Left wing drops	Add weight to right tip
		Right wing drops	Add weight to left tip
J. Tip Weight #2	Fly model towards you or away from you, pull tight inside loop, repeat with outside loop.	Model comes out with wings level	None
		Model comes out with right wing low	Add weight to left tip
		Model comes out with left wing low	Add weight to right tip
K. Side Thrust	Fly model away from you and pull up to vertical.	Model continues straight up	None
		Model veers left	Increase Right thrust
		Model veers right	Reduce Right thrust
L. Aileron Differential	Fly model toward you, pull into a vertical climb before it reaches you. Neutralize controls then half roll.	No Heading Changes	None
		Heading change opposite to roll command	Increase differential
		Heading change in direction of roll command	Decrease differential
M. Dihedral	Fly model on normal pass, roll to knife edge, left and right, use rudder to hold model level.	Model does not roll	None
		Model rolls indirection of rudder	Reduce dihedral
		Model rolls opposite to rudder	Increase dihedral

Note A: These two methods for determining the C.G. of a model will give approximate results only. Start out with the C.G. where the Designer suggested, or somewhere between 25% to 35% of the Mean Aerodynamic Cord. The optimum C.G. for your model will require further testing while performing maneuvers. The results will only be an approximation at best.

Note B: This portion of the trimming chart may be unclear for the following reason; In order to maintain level upright flight, the wing of a plane with a symmetrical airfoil needs to have a positive Angle of Attack (AOA, usually less than 1 degree). This positive angle provides the lift required to cause the plane to fly level. If the plane is balanced slightly to the nose heavy side (required for pitch stability), it will require a slight up elevator trim to hold level flight. A plane with a zero/zero wing to elevator angle will also need a slight amount of up elevator trim to hold level flight. Therefore, a plane trimmed in this manner will have a tendency to pull to the canopy on a straight, thumbs off, down line because the elevator is controlling the AOA of the wing.

This positive AOA may also be achieved by a positive incidence change, which requires an offsetting down elevator for level flight. Thus, a power-off down line should fall straight down, with neutral controls. There are significant interactions between wing incidence changes and CG, therefore *it is most important that the C.G. of the airplane be established first*.

In the final analysis, flight trimming an airplane is a personal preference issue after you have taken care of the basic essentials.