

Trimming for F3A Aerobatics



The following guidelines work best if your aircraft has been built with a straight fuselage and wings and the manufacture's weight recommendation has not been exceeded. Centre of gravity should also start as close to the manufacture's specification as possible. However, following these guidelines will benefit any aircraft. Conduct tests in reasonably calm weather.

The primary aim of trimming your aircraft is to have one that has "pure inputs," where control inputs result in singular movements without unintended pitching, rolling or yawing. It is also so the aircraft continues along the last line flown, without any deviation in roll, pitch or yaw. The objective is to reduce the workload on the pilot whilst flying a schedule.

The Basics			
1	Trim your model for straight and level flight with the engine set at just over half throttle. Aircraft smaller than two metres may need a slightly higher throttle setting but full throttle should not be required. If you have tailplane incidence adjusters, it is assumed that you have trimmed out the inaccuracies to leave the tailplane and elevators level. Check that all servo throws are matched to recommended settings and there is no play in the control linkages.		
Engine Thrust Line			
2	Hold straight and level flight at just over half throttle then smoothly increase the throttle to full.	Model climbs. Model dives.	Increase engine down thrust. Decrease engine down thrust.
3	Fly straight and level and then pull to vertical.	Model pulls to the left. Model pulls to the right.	Add more engine right thrust. Decrease engine right thrust.
Balance - Centre of Gravity			
4	Fly straight and level, increase the throttle to full and pull to a 45° climb. Hold the 45° line then roll to inverted.	After rolling inverted, down elevator must be used to maintain the 45° line. If the model climbs.	Add weight to the tail. Add weight to the nose.
5	Go back to 1.		
Wing Incidence			
Wing incidence should be related to the datum line (fuselage reference line given by the manufacturer) of the model. The wing incidence can also be related to the centre line of the tailplane aerofoil. The two reference lines may be different.			
6	Start high and reduce throttle to tick over and dive in a straight line.	Model pulls to canopy. Model pulls to belly.	Reduce wing incidence OR Increase tailplane incidence. Increase wing incidence OR Decrease tailplane incidence.
7	If any incidence is changed go back to 1.		

Lateral balance			
8	Fly model towards you and pull a tight loop. Repeat for outside loop.	Wing drops at exit.	Add weight to high wing tip.
OR			
	Roll model inverted at half throttle.	Wing that drops is the heavy wing.	Add weight to other wing.
Aileron differential - achieve axial rolls			
9	Fly model towards you and pull into a vertical climb, then half roll.	If after the half roll your model changes heading. In the same direction as the roll. (i.e. If the roll is to the right and after the half roll the models heads to the right). Opposite direction to the roll.	Increase aileron differential (up going aileron to move further than down going aileron). Decrease aileron differential.
Dihedral			
Rolling when rudder is applied can be resolved by changing the dihedral of the wing or moving the wings higher or lower. However, this can be a lot of work and a control mix will be a far easier change and will most often be an acceptable compromise.			
10	From straight and level flight, roll to knife edge and hold top rudder to maintain level flight.	If the model rolls to inverted. Model rolls back to upright	Increase dihedral. Decrease dihedral.

Trimming should be a constant concern to make the most of your model and it is expected that you may have to revisit the above chart to improve your models flight characteristics.

Make one adjustment at a time and check the effect thoroughly before making any further adjustments.

If all the above suggestions do not achieve the desired results, consider electronic mixing of controls, for instance if to maintain a flat turn through 360° the nose drops, mixing some up elevator to react to 80% rudder may solve the problem without affecting other manoeuvres like knife edge flight where less rudder will be used, or you may wish to program a switch to apply the mix when required. It may be a lot less work to apply a mix than change the dihedral.

There are some highly regarded pilots who are said to rely more on electronic mixing than mechanical trimming to achieve their 'required feel'. So trimming is an individual art which you will develop with time and experience. This guide is the starting point.

For those wishing to correct a basic design fault, the first action is to decide on a fuselage datum line. This is the attitude of the fuselage in relation to the straight and level line being flown. All other incidences (wing, canalyser, tailplane and engine thrust line) are then set with reference to the fuselage datum line.

Rudder hinge line angle and proportions of the rudder can also affect rolling when rudder is applied, however these are not easily changed and a mix may be used.