HOW TO SET UP AND TRIM A MODEL AIRCRAFT

By

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Aims of the Talk Tonight

- What are we trying to achieve
- How to set up a model prior to flying for the first time
- What to look for on your first flight
- How to trim a model to correct problems

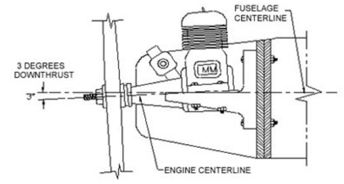
What are we trying to achieve

- Hands off Straight and Level Flight
- No coupling between the controls
- Control – Enough for what you need, but not too much to cause problems.
- Controls give Predictable and Repeatable results.
- A model which is easy to fly any way up.

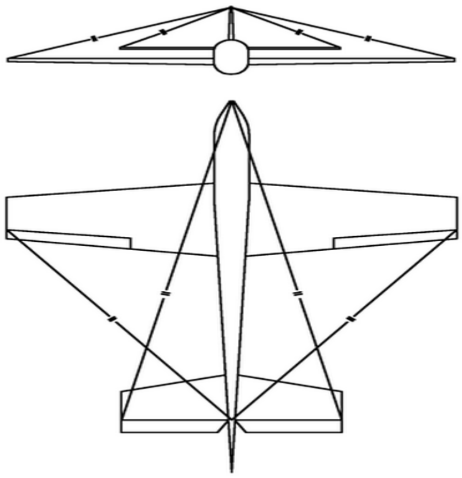
Model setting up and trimming is always a compromise

How to set up a model prior to flying for the first time

Airframe Alignment



Engine Down and Side Thrust



Airframe Alignment

Centre of Gravity Testing

- Different aircraft have different C of G requirements:-
  - 3D – Towards tail heavy
  - Pattern – Neutral to slightly tail heavy
  - Sport – Neutral to slight nose heavy
  - Trainers – Nose heavy
- When to check it?
- How to check Longitudinal C of G
- How to check Lateral C of G

Important:-

C of G too far forward – Model flies badly,
C of G too far back – Model flies only once

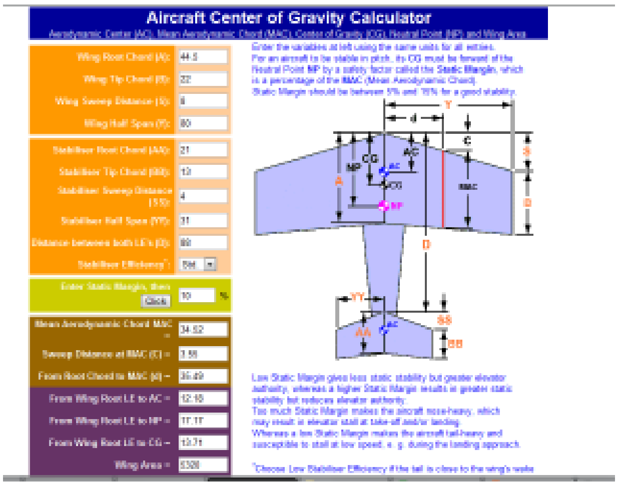
Centre of Gravity

Manufacturers Stated Value:- Between 15 and 16 cm back from Leading Edge

C of G Calculator

http://adamone.rchomepage.com/cg_calc.htm

5 % SM 15.44 cm
10 % SM 13.71 cm
15 % SM 12 cm



Internet — Manufacturers C of G is too far back, General opinion is it should be 14 cm back from Leading Edge max.

What size Servo do you need?

Yak 54

Maximum airspeed (mi/hr): 80

	Aileron(s)	Elevator(s)	Rudder
Average control surface chord (cm)	7	7	10
Average control surface length (cm)	67	48	28
Maximum deflection of servo arm from center (degrees)	30	30	30
Maximum deflection of control surface from center (degrees)	20	20	35
Maximum required torque at maximum airspeed (Kg/cm)	**2.8**	**2.0**	**7.6**

300 Extra

Maximum airspeed (mi/hr): 50

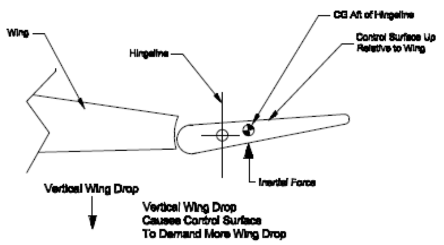
	Aileron(s)	Elevator(s)	Rudder
Average control surface chord (cm)	6.5	5	8
Average control surface length (cm)	50	40	24
Maximum deflection of servo arm from center (degrees)	30	30	30
Maximum deflection of control surface from center (degrees)	45	45	45
Maximum required torque at maximum airspeed (Kg/cm)	**4.0**	**1.9**	**2.9**

Pushrod, Snake or Pull-Pull connections

- Requirements
  - Slop Free
  - Strong Enough to carry the forces
  - Flutter Free
- Types
  - Pushrods
  - Pull Pull Controls
  - Snakes
  - Torsion Bars

Flutter Prevention

- What Causes Flutter



- How to prevent it
  - Slop Free Linkages
  - Mass Balancing Control Surfaces

What to look for on your first flight

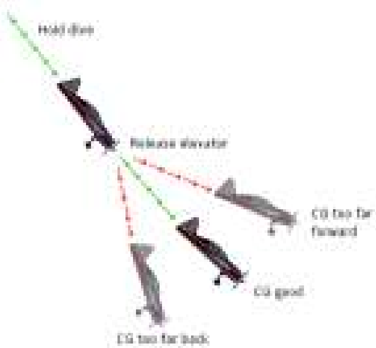
Centre of Gravity Initial check – 45 degree Dive Test

Step 1 – Trim the model for a nice hands free glide with Engine on tick over.

Step 2 – Put the model into a 45 degree dive

Step 3 – Neutralise the elevator and watch what happens

What to look for



Note: Repeat test near end of flight when fuel tank is low
(i.e. C of G it as far back as it will get during the flight)

C of G Lateral Test

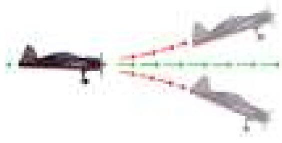
- Trim the model for hands free glide
- Push the nose down into a vertical dive
- Neutralise the controls
- Pull up elevator (careful not to add any aileron)
- Watch what the model does
- Model should fly with wings level.

Engine Thrust Adjustment

Down Thrust

Step 1 - Trim model for hand free flight at Cruise throttle setting

Step 2 - Open Throttle and watch what happens to model



Too little Down Thrust

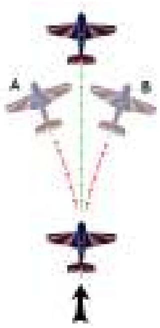
Too Much Down Thrust

Engine Thrust Adjustment

Side Thrust

Step 1 - Fly the model flat then pull up into a vertical climb with throttle set to Full.

Step 2 - Watch what happens to the model



A – Too much Left Thrust

B – Too much Right Thrust

Centre of Gravity – Fine Adjustment

Inverted Flight Test

- Step 1 – Trim the model for level flight at cruising Speed
- Step 2 – Roll Inverted and see how much Down Elevator is required to continue flying level.

- C of G too far back - Up elevator or no elevator required
- C of G about right – A little Down elevator required
- C of G too far forward – A lot of down elevator required

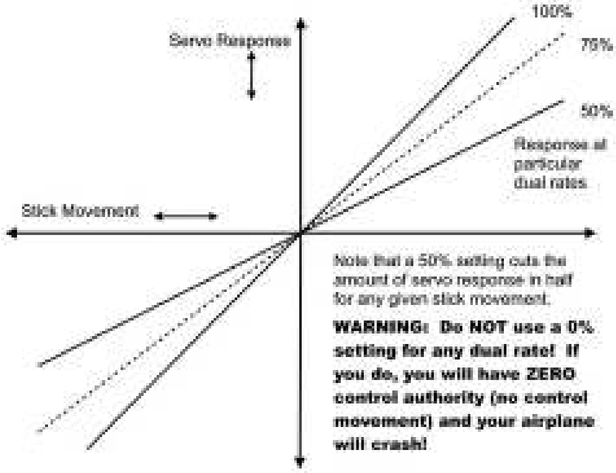
Computerised Transmitters

- Servo Reversing
- End Stop Adjustment
- Mixing
- Dual Rates
- Exponential

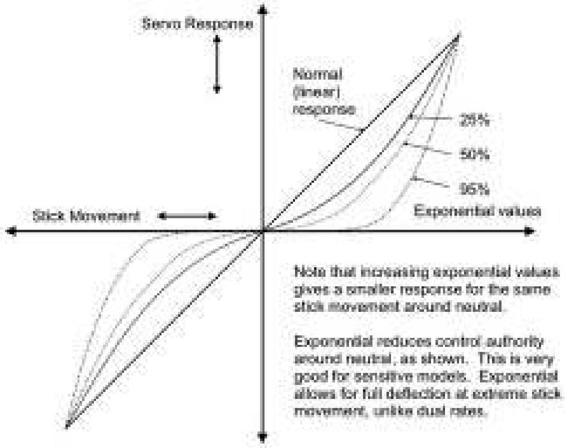
Mixing

- The ability of one function to affect another.
- Most common mixes are:-
  - Rudder – Aileron – To correct rolling action on applying rudder.
  - Rudder – Elevator – To correct diving action on applying rudder
- How much do I need?

Dual Rates



Exponential



Example of the Computer settings on my Wot 4 XL

	Low Rates		High Rates	
	Exponential	Rate	Exponential	Rate
Rudder	40%	60%	40%	100%
Elevator	30%	75%	30%	100%
Aileron	40%	75%	40%	100%

Rudder Mixes

		Left	Right
	Rudder - Aileron	-19%	-19%
	Rudder - Elevator	7%	7%