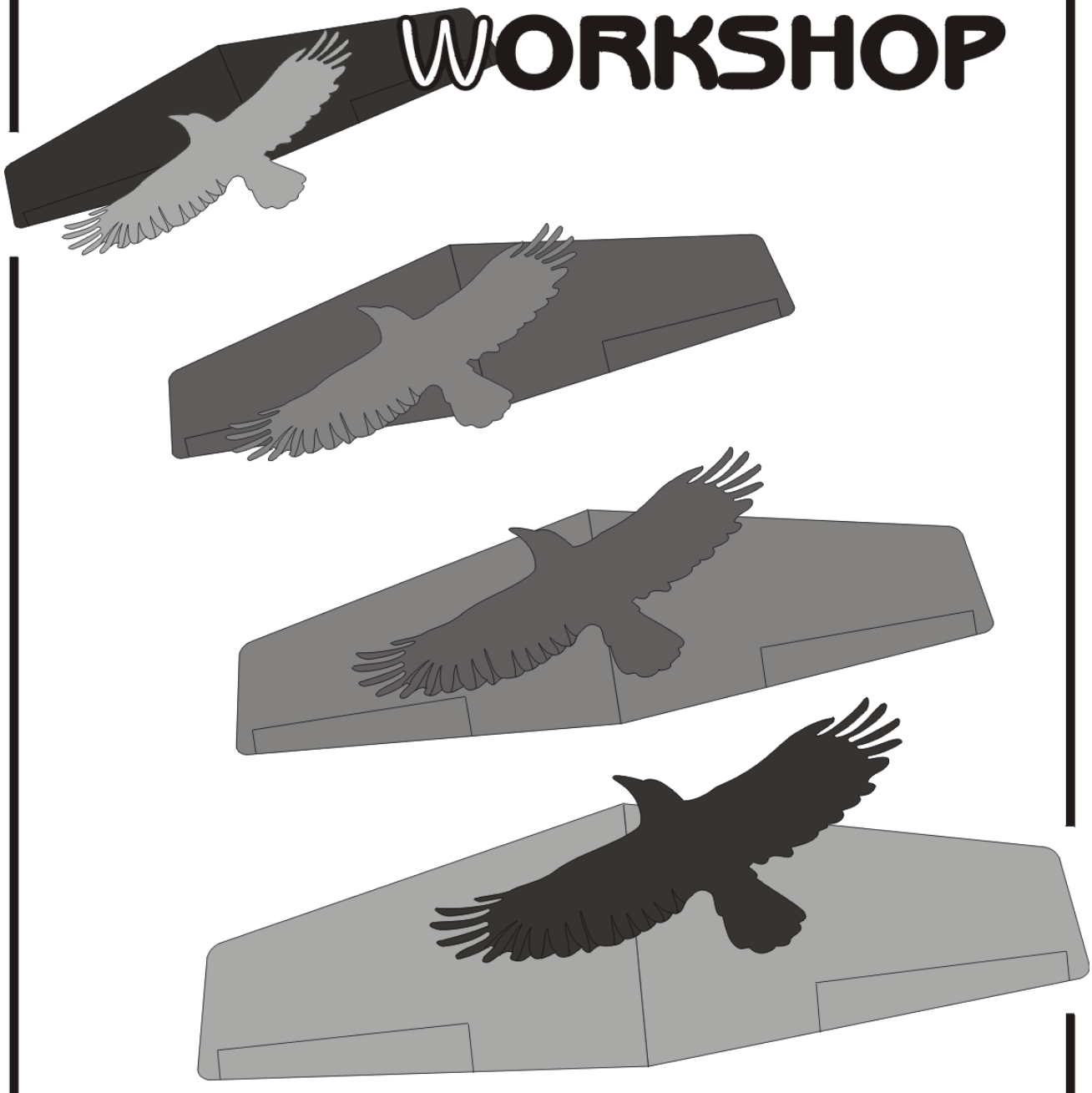
MODEL FLYING WORKSHOP



Presented by

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to raise funds for the

2001 F3A Team

WORKSHOP SPONSORS

We greatly appreciate the support given to the 2001 F3A Aerobatics team by the following sponsors:

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1. MODEL SETUP

It is important that you spend 70% of the time setting up the model and 30% flying the model.
This will ensure that you do not “fight” the model to perform the required manoeuvres.

It is important to follow the sequence of setting up the model, otherwise some of the corrections will negatively influence the model characteristics you are trying to correct .

2. STATIC SETUP

First perform the following static setup before flying the model.

- Neutralize all the control surfaces.
- Measure the throws of all the control surface and adjust ATV and control horn positions to have exactly the same amount of throw.
- Check that the vertical fin is perpendicular to the stab. This should be done during the construction phase.
- Check whether the wing and stab are parallel to each other. Adjust if required.

- CONTROL HORN SETUP

- To ensure best linearity between stick position and control surface it is necessary to have the control horns and the pushrods perpendicular to each other.

There are certain tradeoffs that must be made when setting up the control horns and linkages. The tradeoffs are as follows:

CHARACTERISTIC	SERVO ARM	CONTROL HORN
Fast control surface response	Maximum length	Minimum length
Maximum Torque	**Minimum length**	**Maximum length**
Highest precision	**Minimum length**	**Maximum length**
Least play	Maximum length	Maximum length

The bold printed setup is the best for precision aerobatics and best utilization of your equipment.

3. FLYING SETUP

The trim chart below lists most of the characteristics that need to be checked during flight.

TO TEST FOR	TEST PROCEDURE	OBSERVATIONS	ADJUSTMENTS
1. Control neutrals.	Fly the model straight and level.	Use transmitter trims for hands-off straight and level flight.	Adjust clevises to centre transmitter trims.
2. Control throws.	Fly model and apply full deflection of each control in turn.	Check response of each control.	Aileron: Hi-rate, 3 rolls in 3 to 4 seconds. Lo-rate, 3 rolls in 6 seconds. Elevator: Hi-rate to give a smooth square corner. Lo-rate to give a loop of approximately 50 meter diameter. Rudder: Hi-rate approximately 30 to 35 degrees for stall turns, Lo-rate to maintain knife-edge flight.
3. Centre of gravity. (Method 1)	Roll model into a near vertically banked turn.	a. Nose drops. b. Tail drops.	a. Add weight to tail. b. Add weight to nose.
Centre of gravity. (Method 2)	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.
Centre of gravity. (Method 3)	Power off vertical dive cross wind	a. Model tucks to belly b. Model pulls out to the canopy	a. Tail heavy - Add weight to nose. b. Nose heavy - Add weight to tail.
4. Decalage.	Power off vertical dive, cross wind (if any). Release controls when model is vertical (elevator must be neutral)	a. Model continues straight down. b. Model starts to pull up (nose up). c. Model starts to tuck in (nose down).	a. No adjustment required. b. Reduce incidence. c. Increase incidence.

TO TEST FOR	TEST PROCEDURE	OBSERVATIONS	ADJUSTMENTS
5. Tip weight. (coarse adjustment)	Fly the model straight and level, upright into wind. Pull up sharply to a vertical climb. Repeat the test flying the model inverted into wind	a. Model continues straight up. b. The model veers to the left of vertical. c. The model veers to the right of vertical. a. Model continues straight up. b. The model veers to the left of vertical. c. The model veers to the right of vertical.	a. No adjustment required. b. Add weight to right tip. c. Add weight to left tip. a. No adjustment required. b. Add weight to left tip. c. Add weight to right tip.
6. Elevator alignment.	Measure neutrals and maximum throws of each elevator in both direction.	a. Up and down throws the same. b. Different throws.	a. No adjustment required. b. Adjust ATV if separate elevators are used or adjust control horn length to equalize throws.
7. Aileron alignment	Fly the model straight and level into wind, roll the model inverted and maintain level flight. Apply no aileron correction.	a. Model does not roll b. Model rolls to the right. c. Model rolls to the left.	a. No adjustment required. b. Lower the right aileron. c. Lower the left aileron.
8. Dihedral.	Fly the model straight and level into any wind, apply rudder and watch for any tendency for the model to roll. Also check the effect during knife edge flight. a. Test in both directions. b. Make changes in increments of no more than 3mm at a time. c. Don't worry about the nose pitching down or up.	a. The model does not roll. b. The model rolls in the direction of the applied rudder. (Proverse roll) c. The model rolls in the opposite direction to the applied rudder. (Adverse roll)	a. No adjustment required. b. Reduce dihedral. c. Increase dihedral.
9. Side thrust.	Fly the model away from you and into any wind. Pull it smoothly into a vertical climb going at least to normal manoeuvre height. (Watch for deviations to the left or right as it slows down)	a. Model continues straight up. b. Model veers left. c. Model veers right.	a. No adjustment required. b. Add right thrust. c. Reduce right thrust.

TO TEST FOR	TEST PROCEDURE	OBSERVATIONS	ADJUSTMENTS
10. Up / down thrust.	Fly the model cross wind, at a distance of around 100m from you, (elevator trim should be neutral as per test number 3), throttle back quickly.	a. Model continues straight up. b. Model pitches up. c. Model pitches down.)	a. No adjustment required. b. Reduce down thrust. c. Increase down thrust.
11. Pitching in knife-edge flight. (Method 1)	Fly the model on a normal pass and roll into knife-edge flight, maintain height with top rudder. (Do this test in both left and right knife-edge flight)	a. There is no pitch up or down. b. The nose pitches up. (the model climbs laterally) c. The nose pitches down. (the model dives laterally)	a. No adjustment required. b. Alternative cures: 1. Move the C of G aft. 2. Increase wing incidence. 3. Add down trim to ailerons. c. Reverse the above.
11a. Knife-edge tracking. (Method 2)	Fly the model on a normal pass and roll into knife-edge flight, maintain height with top rudder. (Do this test in both left and right knife-edge flight)	a. The model does not pitch up or down. b. The model pitches to the canopy in both knife-edges. c. The model pitches to it's bottom in both knife-edges. d. The model pitches in opposite directions in each knife-edge.	a. No adjustment required. b. Lower both ailerons slightly - approximately 2 turns. c. Raise both ailerons slightly - approximately 2 turns. d. Use mixing from rudder to elevator to fix the problem.
12. Power off tracking. Test 1	Fly the model level into any wind, pull the power off and watch for any roll off to either side.	a. No roll to either side. b. The model rolls left. c. The model rolls right.	a. No adjustment required. b. Mix 2% to 3% right aileron to low throttle, enough to neutralize the roll. c. Mix 2% to 3% left aileron to low throttle, enough to neutralize the roll.
12a. Power off tracking. Test 2	Fly the model high at a distance of approximately 100m into or across wind but sideways to yourself, push it into a vertical dive, watch for any tendency to roll whilst in the dive.	a. The model shows no tendency to roll. b. The model rolls to its left. c. The model rolls to its right.	a. No adjustment required. b. Mix some right aileron to low throttle, enough to neutralize the roll. c. Mix some left aileron to low throttle, enough to neutralize the roll.

TO TEST FOR	TEST PROCEDURE	OBSERVATIONS	ADJUSTMENTS
12b. Power off tracking. Test 3	Fly the model high at a distance of approximately 100m across any wind but sideways to yourself, push it into a vertical dive, watch for any tendency to pitch up or down whilst in the dive.	a. There is no pitching, the model continues straight down. b. The model pitches up, towards the canopy. c. The model pitches down, towards the bottom of the model.	a. No adjustment required. b. Mix 2% to 3% down elevator to low throttle. c. Mix 2% to 3% up elevator to low throttle.

Notes:

1. Trimming must be done in calm conditions.
2. Abbreviations are used.
3. Make multiple tests before making adjustments.
4. If any changes are made, go back over previous steps and verify or readjust if necessary.
5. A good decalage starting point is 0 deg wing, 0 deg stab, 1,5 deg down thrust and 1,5 deg right thrust.
6. The model should have been perfectly aligned whilst being constructed.
7. Static balance the model prior to flying it.
8. Setting the C of G between 34% and 38% of the MAC is a good starting point.
9. All vertical dives are power off.

Take your time - trimming is a constant procedure throughout the life of your aircraft.
If a trim condition changes noticeably, inspect all airframe and control components carefully to determine what caused the change.

4. TRANSMITTER SETUP

STICK TENSION

- Mode 1, increase the stick tension on the elevator stick . This will ensure that no elevator input is given during point rolls.

- Mode 2

EXPONENTIAL SETTINGS

Use as little exponential as possible. Typical settings are 10% for aileron and elevators and 30 to 40% on rudder.

DUAL RATES AND CONDITIONS SETTINGS

To be used for snaps, stall turns etc.

5. ENGINE SETUP

The most reliable way of setting the engine up is described below. To perform these tests it is necessary to be able to pinch the fuel line to the carburetor while the engine is running.
CARBURETOR SETTINGS

- Full throttle adjustment.

Set the top end needle for maximum RPM and turn it 2 to 3 clicks back. At full throttle, briefly pinch the fuel tubing to the carburetor or the fuel pump. If the revs drop immediately after pinching the line, the setting is to lean. Turn out the needle valve a few clicks and repeat the test until the revs picks up slightly and the drop.

- Idle needle adjustment

After setting the top end proceed with the idle adjustment.
Let the engine idle for 10 to 15 seconds and pinch the fuel tubing closed. While keeping it closed, if the engine stops immediately the idle setting is too lean. Turn the idle mixture screw out 1/8th of a turn at a time. If the revs takes 3 to 5 seconds to pick up and then stops, the idle mixture is to rich. Turn the idle mixture screw in 1/8 of a turn at a time.
Recheck the top end setting again as the idle screw has some effect on the top end.

6. PRINCIPLES OF AEROBATICS FLYING

PRECISION

LINES

LOOPS

HEADINGS

CONSTANT RADII

CONSTANT ROLL RATES

GRACEFULNESS

7. JUDGING CRITERIA

See the sporting code for details.

8. AEROBATICS SCHEDULES

See sporting code for details