



# Akro Special

By Terry Westrop

Photos by Andy Nicholls

**Editor's Notes:** Pilot/designer Terry Westrop lives in England and has been flying and competing in aerobatics since 1981. He flew Pattern until 1983, at which time he started in the F3A Turnaround events. The following year, he was using a semi-scale, fixed landing gear model with wheel pants. That looked great but was not aerodynamically clean enough in rough weather. It was then, in 1985, the Akro series was developed to combat all weather conditions.

At the present time, Terry is not sponsored and doesn't recommend any particular equipment. The aircraft will accommodate most any type the builder prefers.

What makes a good aerobatic pilot? Terry feels it helps to have the correct equipment, but most of all, you need patience and dedication. This starts from the initial trimming through

many hours of practice and studying the fliers you are trying to catch. It is not only the flying, but the preparation and competition attitude that provides that little extra that is required.

Terry's contest success is as follows: 1986 overall championship in U.K., consisting of three wins, a second, and

**Akro Special is one of the top contenders in the F3A Aerobatic Turnaround in England — try it — you'll like it!**

a fourth at the Nats. 1987 Nationals winner, second overall championship U.K., consisting of four seconds, and a first at Nats.

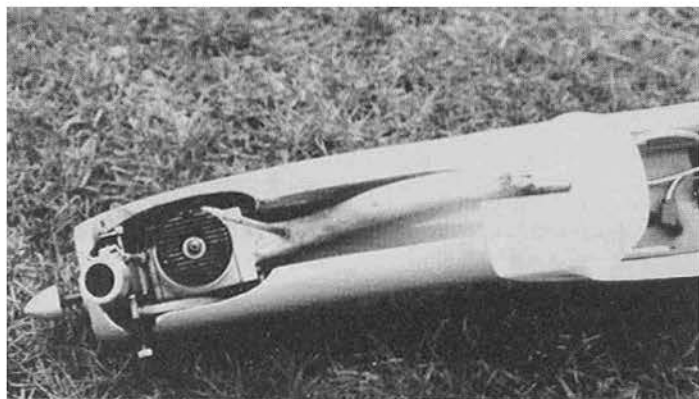
The following is a bit of information pertaining to the '87 Nats:

The 1987 British National Aerobatics was a three day event held at R.A.F. Barkston Heath,

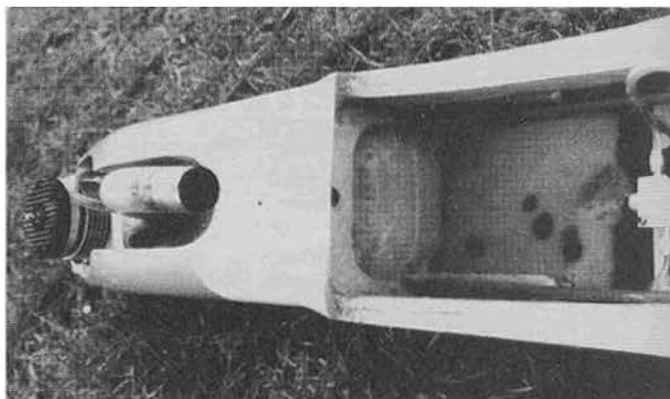
Lincolnshire, with the fly-off on the third day. Turnaround FAI F3A only was flown continuously on one flight line with 37 competitors starting at 8 a.m.

Flying conditions were generally good, although the light cross wind persisted between 60° and 90° at times, making it difficult to decide the direction to begin the flying.

Models were split between Akro Specials, Adagio, Super Dalotel, and Super Challenger, with a few Jokers. Generally, the larger 800 square inch wing area types predominated. Engines also proved variable with O.S. (the new rear exhaust long stroke pumper), Y.S. Yamada and Webra the most numerous with Rossi and Super Tigre in lesser numbers. Propellers are now almost as important as the power plant itself. With the noise restrictions (98 dba at 3 meters), static rpm



Bottom side showing inverted engine and tunnel for exhaust header.



This shows 16 oz. tank fitted behind firewall.

## AKRO SPECIAL

Designed By:

Terry Westrop

### TYPE AIRCRAFT

F3A Turnaround Aerobatic

### WINGSPAN

66 Inches

### WING CHORD

12 1/2 Inches (Avg.)

### TOTAL WING AREA

825 Sq. In

### WING LOCATION

Low Wing

### AIRFOIL

Symmetrical

### WING PLANFORM

Double Taper

### DIHEDRAL (each tip)

7.8 Inch

### OVERALL FUSELAGE LENGTH

59 Inches (incl. spinner)

### RADIO COMPARTMENT SIZE

(L) 15" x (W) 3" x (H) 2 1/4"

### STABILIZER SPAN

24 Inches

### STABILIZER CHORD (incl. elev.)

7 1/2 Inches (Avg.)

### STABILIZER AREA

180 Sq. In.

### STAB AIRFOIL SECTION

Symmetrical

### STABILIZER LOCATION

Mid-Fuselage

### VERTICAL FIN HEIGHT

6 1/4 Inches

### VERTICAL FIN WIDTH (incl. rud.)

6 Inches (Avg.)

### REC. ENGINE SIZE

61 Cu. In.

### FUEL TANK SIZE

16 Oz.

### LANDING GEAR

Conventional

### REC. NO. OF CHANNELS

4-6

### CONTROL FUNCTIONS

Rud., Elev., Throt., All.,

Retracts, & Mixture Control

### BASIC MATERIALS USED IN CONSTRUCTION

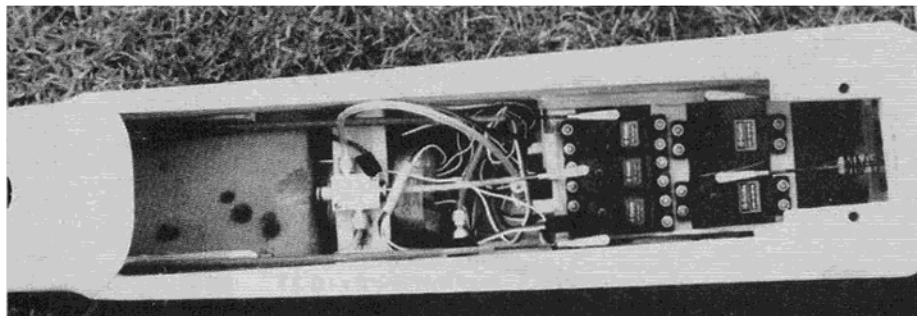
Fuselage ..... Balsa & Ply

Wing ..... Foam & Balsa

Empennage ..... Foam & Balsa

Wt. Ready To Fly ..... 126-133 Oz.

Wing Loading ..... 22.75-23.9 Oz./Sq. Ft.



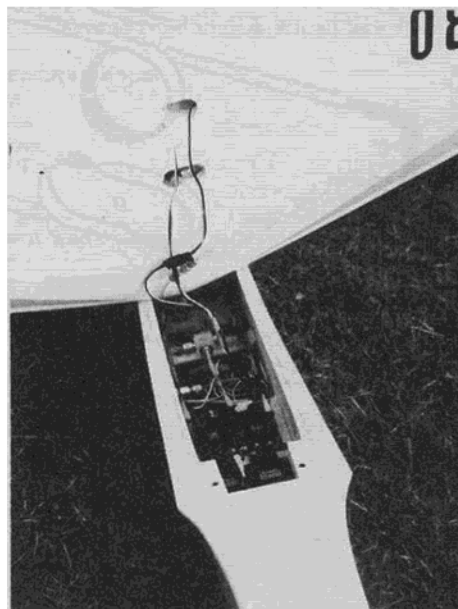
The radio compartment has, on the right, rudder and elevator servos; next is the three across which includes: throttle, retract valve, and mixture control. Air tank is in turtle deck area above and behind R & E servos.

generally ran between 10,500 and 12,000. Propeller types used were between 9 and 11 inches of pitch. Tuned pipes must be of the "quiet" type such as Rossi 65 or Hatori. Almost all sported retractable landing gear of the air operated type.

The following list is the results of the Nats F3A fly-off.

This Akro Special is the latest version of my precision aerobatic airplane designed specifically to meet the requirements of the Turnaround schedules. The new schedules introduced in 1984 are more challenging to both model and pilot. The novice programme used in the UK is included in this report.

Akro is a constant, moderate speed model, aiming to give the schedule a more graceful appearance and produce smoother flying. Unlike pattern models and schedules that would tolerate weights approaching 11 pounds and remain competitive, it



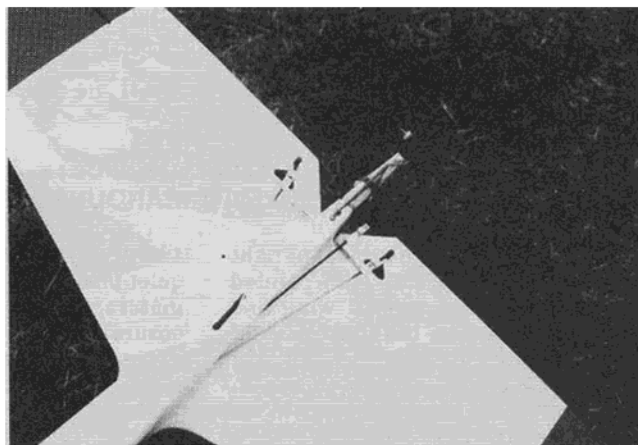
Everything plugged in and ready to bolt down.

NAME	MODEL	ENGINE	PIPE	SCORE
1. Terry Westrop	Akro Special	O.S. RFP	Rossi 65	3966
2. Ken Binks	Adagio	Y.S.	Hatori	3909
3. Graham Briggs	Joker	Webra	Hatori	3737
4. Steve Elias	Akro Special	O.S.RFP	Hatori	3494
5. Andy Nicholls	Akro Special	Webra L.S.	Rossi 65	3441
6. Kevin Katon	Adagio	Redshift	OPS	3389

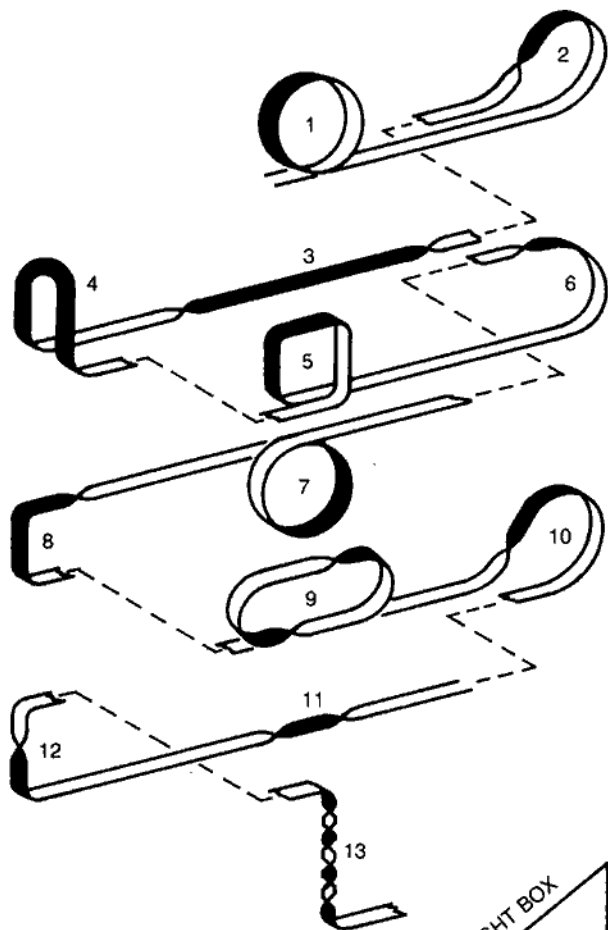
Scores were normalized to FAI rules. Highest individual score: Terry Westrop at 394 points on Round 4



Tail wheel steering is very simple. Routed antenna out the bottom of fuselage.



Split elevator pushrods and rudder pushrod shown here. Note close fit of elevator and stab.



1 THREE INSIDE LOOPS

2 HALF CUBAN

3 STRAIGHT INVERTED

4 STALL TURN

5 SQUARE LOOP

6 IMMELMANN

7 THREE OUTSIDE LOOPS

8 HALF ROLL HALF SQUARE LOOP

9 DOUBLE IMMELMANN

10 HALF REVERSE CUBAN

11 SLOW ROLL

12 HALF SQUARE LOOP HALF ROLL

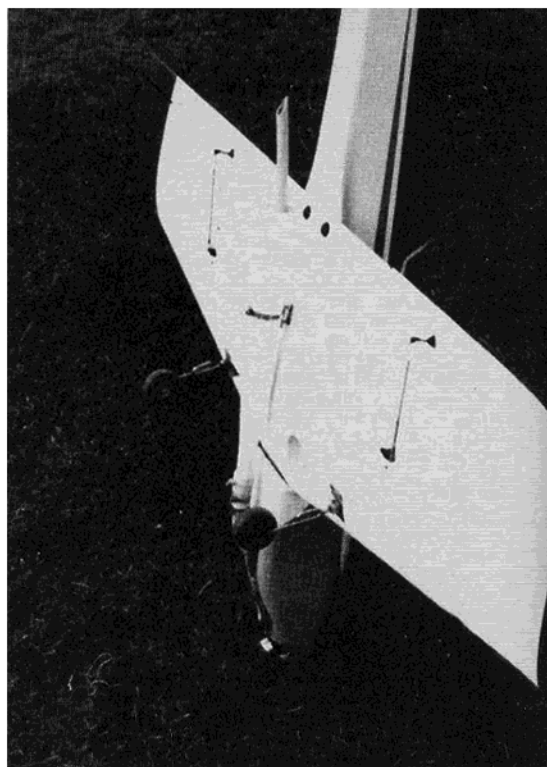
13 THREE TURN SPIN

### UK STANDARD (NOVICE) SCHEDULE TURNAROUND

is a distinct advantage to build as light as possible. Six variants using painted fuselage and film covered wing and stab, retractable landing gear, 7 servos, piped .61 weighing between 7.9 and 8.3 pounds. This produces an extremely good wing loading.

FAI regulations state maximum noise emission measured opposite the propeller at 1 meter should not exceed

105 db. To meet this requirement, quiet pipes, 11½ x 11 props, and ABC motors maintained in good order, ensure success. The disadvantage in using high pitch props is that much more sidethrust is necessary if the model is required to hold a vertical line hands off. However, if speed props are used, typically 15,000 rpm, less than half the amount shown should be



Bottom view showing dual aileron servos, retracts, and tuned pipe.

incorporated.

At around 8 pounds, Akro Special is extremely easy to fly with or without retractable landing gear, although for serious competition, the cleaner the model, the smoother it performs, especially in windy conditions. Not only does the airplane look good on the ground but presents itself nicely during maneuvers. Despite comparative lack of side area and outright flying speed of the pattern planes, knife-edge capabilities remain unlimited.

Akro Special has given me three firsts, a second, and two fourth places during the 1986 season, enough to take the UK championship. It also gave me a first in the 1987 UK Nationals.

### CONSTRUCTION

Although model design and specifications were the first consideration, building is very simple, I will describe my particular method to produce the airplane in the shortest time, but will keep you busy all the time. Remember accurate building makes for a more precise flying airplane.

#### Wing:

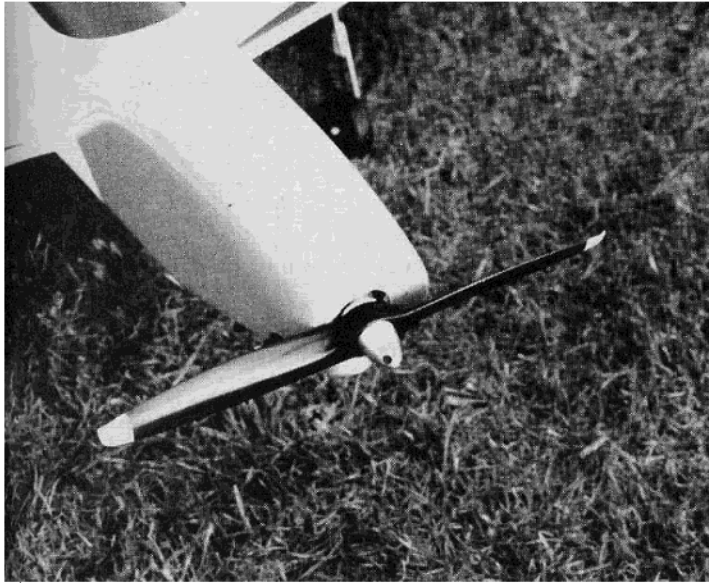
Begin with the veneered foam panels edged in ¼" balsa and with 1" sheet tips. Cut retract and servo bays to suit your hardware and bore 1/2" holes.

#### Fuselage:

Produce 3/16" sides and fix all longerons. Make formers 3 and 4.

#### Wing:

Epoxy U/C bearers and 1/32" ply



Note engine offset. This was Terry's 1986 Akro.

## MATERIALS LIST

### Fuselage Sheet

- 4 — 3/16 x 4 Sides and Decks
- 2 — 1/2 x 3 Fuselage Top, Fin, Rudder
- 1 — 3/8 x 3 Deck Top
- 2 — 3/32 x 3 Fuselage Bottom & Facings
- 1/32 Ply x 12" x 18" Wing Fillets & U/C Liner
- 1/64 ply x 6" x 12" Manifold Channel

### Fuselage Sticks 36"

- 2 — 3/4 Right Angle Forward Longerons & Brace
- 1 — 1/2 Right Angle Forward Longerons & Brace
- 4 — 3/8 Right Angle Rear Longerons
- 1 — 3/8 Square Elevator 'Y' Rod
- 1 — 1/2 x 1/2 Hardwood Bolt Blocks and U/C Bearer
- 1/4 Ply 6" x 6" Firewall
- 3 — 1/8 ply 6" x 12" Former Nose Ring & Wing Plate

### Wing & Tail Veneered Foam

#### Materials Extra

- 2 — 1/4 x 3 Edges
- 1 — 1/8 x 3 Facings
- 1 x 4 x 12 Wing Tip
- 5/16 Dowel x 6"
- Glass Tape 3" x 32"
- 1 — 1/16 x 3 Servo Wells



Andy Nicholls was very pleased with his 5th place in his first Nationals (1987).



Terry Westrop and his Akro Special at the '86 Euro Champs at Toulon, in Southern France.

lining. Cut 3/32" well floor to shape and install at a depth suitable for the equipment. If your servos are too large, the boxes should be made to accommodate them laid flat. It is preferable to mount the servo upright as this assists installation and allows differential to be adjusted easily.

#### Fuselage:

Fit 3 and 4 formers to one side.

#### Tail:

Add tip blocks to completed edged panels. Sand and, using epoxy, join at zero dihedral.

#### Wing:

Sand all well linings and mark 1/2" hole exits at centre. Sand roots carefully to give 1 3/4" dihedral under one T.E. tip whilst the opposite T.E. remains flat on the board. Groove L.E. and core for 5/16" dowel. Epoxy join the wing ensuring accurate alignment.

#### Fuselage:

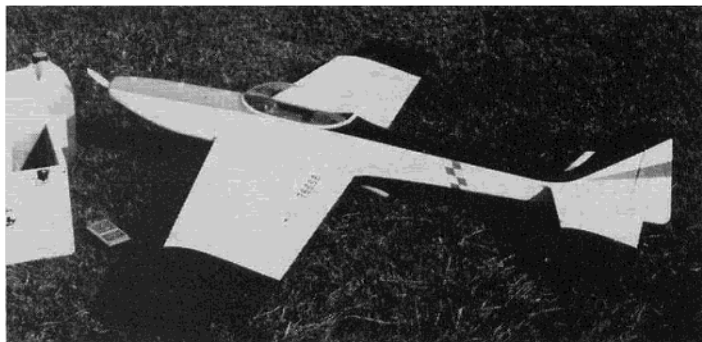
Fit opposite side to formers 3 and 4 keeping the sides parallel. Make F2 to suit motor, and mount motor, drilling

holes for throttle, mixture and tank feeds. Cut the pipe channel if necessary.

#### Wing:



1984 "A" model of Terry's Akro.



1985 version.

Nationals F3A Fly Off

Name	Freq	Rd.1	Rd.2	Rd.3	Rd.4	Fly Off	Total	Place	
K. Caron	67	861	832	861	835	2966	831	3227	6
T. Washrop	65	952	984	1000	1000	3377	946	3768	1
G. Briggs	67	904	922	911	900	3577	1000	3797	3
S. Elias	67	869	881	906	838	2974	833	3446	4
A. Nicholls	67	842	896	866	814	2989	837	3605	5
K. Binks	63	1000	1000	942	954	3411	955	3964	2

Scoreboard at 1987 British Nats.

Install pipe anchor plate and ply bolt plate.

#### Fuselage:

Install F2 with mount and sidethrust required.

#### Tail:

Mark and cut elevators from stab and attach 1/4 facings.

#### Wing:

Three inch tape is used around the centre section using polyester finishing resin as the adhesive. Brush a small amount of resin around and in the U/C wells.

#### Fuselage:

Join tailpost ensuring a straight run. Make formers 1 and 5.

#### Wing:

Sand the dry resin and apply a second coat that is mixed with micro-balloons.

#### Fuselage:

Fit 1/4" tank bay at bottom leaving the gap for the manifold channel if the rear exhaust motor has been fitted. Install 1/2" and 3/4" right angle reinforcement to firewall and F3. Attach Former 5.

#### Wing:

Sand the entire wing smooth and cut out ailerons. Attach 1/4" facings.

#### Fuselage:

Carefully fit 3/16" rear decks, ply manifold channel and 1/2" right angle F3 brace. Cut fin and rudder and shape to airfoil section.

#### Wing:

Aileron — insert 1/8" ply horn plate and 1/8" end facings.

#### Fuselage:

Glass and resin inside of tank bay. Add 3/8" and 1/2" tops, sanding on the dash angle first.

#### Wing:

Drill through top centre section for retract and servo line outlets. Make servo box lids from ply.

#### Fuselage:

Sand nose area, temporarily install motor and align nose ring. Face cockpit area, sand, then add 1/4" x 1/2" sides. Roughly shape and sand the whole fuselage. Drill F3 accurately for wing dowel and fit 1/2" hardwood wing bolt blocks. Align wing on fuselage at correct incidence and drill through for 3/16" bolts. Fit 1/32" ply wing fairings with soft balsa

and add 3/32" bottom sheet. Sand and fit tail at zero incidence. Align and fix the fin. The canopy area can now be prepared and finished as required and the canopy fitted. I use finishing resin plus micro-balloons to blend in the canopy to the fuselage which should now be masked to protect it during the paint stage.

To keep the weight down, it is recommended that only the fuselage be painted. The remainder of the aircraft is filmed. My fuselage was prepared using traditional methods, i.e., heavyweight tissue, sanding sealer, and two coats of primer with polyurethane for color. Mylar is used as hinge material pinned with 1/16" dowel or cocktail sticks. The fin and rudder should be done prior to the primer stage.

#### Installation of Hardware:

The tail gear shown is durable and exerts little pressure on the rudder. The bearing tube is inserted after priming. Bind and solder the two wires well and in line with the rudder. The grommet acts as a noiseless bearing for steering. Alternatively, a commercial bracket can be employed.

All of the models built have required either tail weight or nothing to balance reasonably. Therefore, if similar finishing is used, the servo installation will be at the rear of the wing bay. Prior to installing the "Y" elevator rod, you will find it easier to install the air tank (if using air retracts), as this is placed in the top of the fuselage at the rear of F5. Use liquid silicone to secure the tank. The fuel tank is also secured with silicone. Install as low as possible (for rear exhaust inverted motors). A 500 flat NiCd will, if necessary, fit above the tank. Snake linkages are used for throttle and mixture. Five mini servos are used on ailerons, motor, mixture, and retracts, whilst rudder and elevator use the standard size.

Various motors have been fitted and all have required a 3" drop manifold to maintain a straight run to the tuned pipe. Manifold pressure has proved perfectly adequate. Install the aileron servos just low enough to avoid the ply lids.

#### Surface Throws:

Most every pilot will set up to a personal "feel," therefore, these measurements are intended only as a guide: Ailerons  $\pm 5/16"$ ; elevator  $+3/8"$ ,  $-1/2"$ ; rudder  $\pm 1/2"$ .

As a sport model you'll find Akro Special one of the nicest airplanes you've ever flown, but if you wish to go beyond that stage read on.

Double check everything and fly. The more work you put into the setting up, the easier and more precise will be the flying. It would take a considerable amount of space to explain in detail each stage of the trimming procedure and still more to eliminate possible building inaccuracies that may be contributing to problems. However, there are a few basics that may be of assistance if you wish to obtain maximum benefit from the model. Correct each stage before proceeding to the next.

1. Set up motor and pipe to give maximum performance.

2. Set up control feel to your own requirement.

3. Pull model vertically to check thrust. If model requires right rudder, more right thrust must be added. If down elevator is also needed, down thrust can be increased at the same time.

4. Vertical down motor off (from a good height don't forget); if the model requires down elevator, move the C.G. back 1/4", at the same time make sure the stall turns remain good.

5. Negative loops and corners: if aileron correction is repeatedly necessary (in, say, three outside loops), i.e., right aileron, add small amounts of weight to the left wing. I never static balance an airplane.

6. Aileron differential: on the Akro Special I have not found the necessity to adjust for this, however, just in case: if the model loses track during rolling, (not slow roll), e.g., right roll results in a left change or heading, increase the up going aileron amount. If you've fitted upright mini servos as shown, it can be achieved very quickly, especially with splined output types. Move the arm one spline away from the aileron and adjust linkage.

□