



PRE PATTERN PENNANT
FOR
PROSPECTIVE PATTERN PILOTS
TO
PRACTICE PERFECT PATTERNS

AUSTRALIAN PATTERN ASSOCIATION INC.

AN AFFILIATED SPECIAL INTEREST GROUP OF THE "MODEL AERONAUTICAL ASSOCIATION OF AUSTRALIA"

ABN 81 314 363 705 Reg No A0023519X

PRE PATTERN PENNANT BOOKLET

This booklet has been compiled as a starting point for any person who wants to start flying Sportsman Pattern or is just curious as to what aerobatics is all about.

It has been developed by the Australian Pattern Association, using both its own resources and those of the M.A.A.A.

(Model Aeronautical Association of Australia Inc.)

This booklet is only a starting point, and any prospective pattern flyer is urged to locate an experienced Pattern Pilot who is willing to advise, coach, and assist you (most are), as this is the best way to learn, and is also the most rewarding.

Some of the manoeuvres may seem a little daunting to you at first, because there are so many ways in which a manoeuvre can be downgraded, but the more you practice, the sooner you will get great scores! And keep it in mind that every great World Champion aerobatic flyer also started out the same way as you are doing... as a first-time Sportsman!

The APA (Australian Pattern Association Inc.) is dedicated to furthering and supporting pattern flying. As you progress, why not encourage others to join the Association and also become a part of aeromodelling's most successful Special Interest Group in Australia.

**Fly for fun
And make it fun for others, too!**

A Beginner's Guide to Aerobatics

This guide has been written for the benefit of beginners to 'pattern' aerobatic competition to help them get started, with an appropriate kind of model, and to answer most of the questions that are commonly asked by new people about going along to their first competition. As soon as you can safely, take off and land, fly straight lines and do loops and rolls, you are ready to start 'practicing with a purpose'!

The type of aerobatics run by the Australian Pattern Association is known as F3A, and is called 'pattern' because the pilots fly a prescribed set of manoeuvres, or 'patterns' in the sky. Some people think that pattern is only for the so-called elite flyers. Not so at all! Many get into it simply as a means of very quickly improving their flying skills (maybe so they can fly their scale model better) or simply because flying pattern is fun to do!

There are four 'classes' for the pilots. These are Sportsman, Advanced, Expert, and FAI - F3A (which also includes a 'Masters' sub-category). Beginners start in Sportsman, and when your skill level increases and you obtain the required scores, you will be awarded a 'promotion point'. Three promotion points in a twelve-month period will gain your promotion to Advanced, the next class up. Each class has its' own set of manoeuvres which get more challenging as you go up the classes! Sportsman manoeuvres are designed so that beginners can actually *do* them, while still presenting a real challenge to do well. And this leads us to an important topic: —

What model, what engine and what radio? *The simple answer is to start with what you probably already have.* As with most sports, if you enter at a level that is way over your head, you will get into more strife than Ned Kelly! While they look so smooth and graceful in the right hands, full-on pattern models fly deceptively fast! A little mistake that the beginner doesn't notice and correct *immediately*, can turn a manoeuvre into an unrecognisable one and will result in a very low score!

With an engine of around .46-size, a shoulder-wing "ugly-stick" type model, with no dihedral in the wing, and weighing no more than four pounds without fuel, is quite suitable and very cheap and easy to build. Shoulder-wing is by far the easiest to build and maintain, while low-wing models do roll a bit better. It's hard to go past a light-weight shoulder-wing stick for Sportsman! Please remember the next few words, forever... *the heavier the model weighs, the harder it is to do pattern manoeuvres well.* Putting a bigger engine in an already heavy-ish model doesn't usually work very well at all for pattern; it just makes the model need to fly faster.

Also, keep in mind that you need to actually finish the event... it's all too easy in the excitement to land a model a bit hard on the runway (or miss it!) after a flight, and simple wire undercarriages on 'sticks' can take that, but retracts or fancy carbon undercarriages won't! There are many disadvantages for a new person to begin competing with a full-on pattern model, and very few advantages, if any. But, if you've already been flying a pattern model for some time, and are quite comfortable with it, then use it by all means! As far as the radio goes, if you have a 4-channel radio, that's all you need to start, especially with a simple 'stick' model. Good servos are worth having, though. Modern, fast servos with little slop can transform a model! Computer radios can provide some useful conveniences, but you don't have to use one to start with.

The bottom line is this: make it as easy for yourself as possible while you are 'learning the ropes'. Use what you're already familiar with, model and gear-wise. Practice the manoeuvres, and get to those competitions!

Okay, you've got a model going, and you can fly it around, do some loops, rolls and your straight lines look straight to you. Now what? Firstly, you need a 'caller'... not just someone who can read from your call-card what the next manoeuvre is, but someone not shy in giving you some valuable feedback! If your loops are not round (but *you* think they are!) they must tell you. If your straight lines are twenty degrees skewed to the proper line of flight, ~~they~~ must tell you. You can see here that it's best to get the most experienced caller you can find! If there is anyone at your club with pattern experience, ask them if they could give you some help.

But remember you will *always* find experienced and willing callers at pattern competitions! What is meant here is that you don't need to practice at your local field until you reckon you're 100% perfect! If you practice enough that a local club flier/caller can recognise the manoeuvres you are flying (no matter how many small mistakes you make), get to a competition! As soon as you can fly safely, *nothing* beats flying at a competition for improving quickly!

Well, you're ready to go! What now? The APA newsletter lists the competitions you can go to, and there will be a name and phone number for the CD (Competition Director) who will be running the competition you want to go to. To enter, ring him at least 7 days before the event to give your details, including your radio's frequency. To avoid any confusion here, state the frequency in full, rather than the abbreviated way. For example, say 36.370 instead of 637. At pattern comps, radios must be certified, be on a 20 Khz frequency, using a 2-inch frequency-key with the pilot's name and frequency clearly displayed. (10 Khz frequencies are not used at pattern comps). Also remember to bring your FAI card to prove you're a member of a club and have the MAAA insurance cover.

The CD will give you directions to find the competition site if necessary. You could ask if there's anyone going from near where you live, so you might tag along with them. While it's not the CD's job to find you accommodation, if it's a two-day competition as many are, you might ask about sharing a room with another competitor to save on motel bills, and he may be able to suggest some people for you to phone.

When you first arrive at your first competition, it's polite to find the CD, tell him who you are, and ask if there is anything you can do to help (heaps of brownie-points can be gained here!) but usually you won't have much to do except assemble your model, tune your engine, and maybe get a practice flight in to help calm the nerves! AND this is also the golden opportunity to ask the CD who the best callers are! Some of them might be judging when you will be flying, so they won't be available to help you, but the CD will try to team you up with a good caller. If you end up with the 'Number One' ranked flier in Australia as your first-competition caller, don't fall to pieces! They will still remember being a beginner once, themselves. The top fliers are usually only too pleased to help new people when they are asked.

At competitions, apart from honing your budding aerobatic skills, you will often be paired up with one of the judges to 'pencil' the scores into the score-card, which will help to give you a bit of an introduction to judging, which nearly everyone gets to do later on. Be prepared to sit in a chair for about two hours... bring warm & windproof clothing, a hat and sun block.

For small comps (up to about 18 pilots) there will normally be one 'flight-line' that the pilots fly from. But for about 20 or more competitors, to fit all the flights into the hours available requires the use of two 'flight lines', spaced about 50 metres apart, with a group of judges and pencilers for each. This means that there will be two models in the air together, flying along the same path. You soon learn to not worry about the other model! Pilots will be divided into two groups. When the CD makes the flying-order lists available, see when and on which flight line your turn will be. There will be a 'rotation' after each flight, meaning if you're say, second up for flight one, you might be fourth up for flight two. The pilot in front of you may have an early deadstick, so you need to be fuelled up and ready to go at least two pilots in front of you. Remember who the three pilots are in front of you. Never be late getting yourself on to the line when asked to go!

The CD must control many things when running a competition, not the least important being everyone's personal safety. When you are about to fly (including before the competition actually begins) be very careful you don't take off or land too close to people, including the other flight-line. It's really easy to forget where people are, so always fly with a caller who can inform you of what's going on around you. The CD may decide that because of say, a crosswind that is blowing in strongly, or a narrow runway, he may rule that pilots have their model placed on the runway in a specified take off position to remove any possibility of anyone being alarmed by a model passing closely in front of their face while trying to concentrate on their manoeuvre!

When you arrive at a competition, make yourself known to the other flyers. You'll find it quite easy to fit in, because we've all 'been there before' ourselves as first-timers. Also, at two-day competitions, most of us like to go to dinner together as a group. We usually decide the venue at the end of flying on day one. Ask the CD!

We hope this is of some help to you as a newcomer. If you have any comments from your experiences of starting out that you think we should include in this guide to help others, please let the committee know. Remember that the reason we are on the committee is to help our fellow APA members enjoy their flying!



SPORTSMAN

K-Factor

- | | | |
|----|-----------------------------------|---|
| 1 | Take Off | |
| 2 | DOUBLE IMMELMAN with half rolls | 2 |
| 3 | SLOW ROLL | 3 |
| 4 | TWO INSIDE LOOPS | 3 |
| 5 | TWO HORIZONTAL ROLLS | 3 |
| 6 | TOP HAT with half rolls up & down | 3 |
| 7 | TWO OUTSIDE LOOPS from the top | 4 |
| 8 | SQUARE LOOP ON CORNER | 3 |
| 9 | STRAIGHT INVERTED FLIGHT | 2 |
| 10 | STALL TURN, ¼ ROLLS up & down | 2 |
| 11 | CUBAN EIGHT | 3 |
| 12 | TWO TURN SPIN | 2 |
| 13 | Landing | |

With Compliments of the **APA** *Total K:30*

1 / 2004



SPORTSMAN

K-Factor

- | | | |
|----|-----------------------------------|---|
| 1 | Take Off | |
| 2 | DOUBLE IMMELMAN with half rolls | 2 |
| 3 | SLOW ROLL | 3 |
| 4 | TWO INSIDE LOOPS | 3 |
| 5 | TWO HORIZONTAL ROLLS | 3 |
| 6 | TOP HAT with half rolls up & down | 3 |
| 7 | TWO OUTSIDE LOOPS from the top | 4 |
| 8 | SQUARE LOOP ON CORNER | 3 |
| 9 | STRAIGHT INVERTED FLIGHT | 2 |
| 10 | STALL TURN, ¼ ROLLS up & down | 2 |
| 11 | CUBAN EIGHT | 3 |
| 12 | TWO TURN SPIN | 2 |
| 13 | Landing | |

With Compliments of the **APA** *Total K:30*

1 / 2004



SPORTSMAN

K-Factor

- | | | |
|----|-----------------------------------|---|
| 1 | Take Off | |
| 2 | DOUBLE IMMELMAN with half rolls | 2 |
| 3 | SLOW ROLL | 3 |
| 4 | TWO INSIDE LOOPS | 3 |
| 5 | TWO HORIZONTAL ROLLS | 3 |
| 6 | TOP HAT with half rolls up & down | 3 |
| 7 | TWO OUTSIDE LOOPS from the top | 4 |
| 8 | SQUARE LOOP ON CORNER | 3 |
| 9 | STRAIGHT INVERTED FLIGHT | 2 |
| 10 | STALL TURN, ¼ ROLLS up & down | 2 |
| 11 | CUBAN EIGHT | 3 |
| 12 | TWO TURN SPIN | 2 |
| 13 | Landing | |

With Compliments of the **APA** *Total K:30*

1 / 2004



SPORTSMAN

K-Factor

- | | | |
|----|-----------------------------------|---|
| 1 | Take Off | |
| 2 | DOUBLE IMMELMAN with half rolls | 2 |
| 3 | SLOW ROLL | 3 |
| 4 | TWO INSIDE LOOPS | 3 |
| 5 | TWO HORIZONTAL ROLLS | 3 |
| 6 | TOP HAT with half rolls up & down | 3 |
| 7 | TWO OUTSIDE LOOPS from the top | 3 |
| 8 | SQUARE LOOP ON CORNER | 3 |
| 9 | STRAIGHT INVERTED FLIGHT | 2 |
| 10 | STALL TURN, ¼ ROLLS up & down | 2 |
| 11 | CUBAN EIGHT | 3 |
| 12 | TWO TURN SPIN | 2 |
| 13 | Landing | |

With Compliments of the **APA** *Total K:30*

1 / 2004

DOUBLE IMMELMAN

SLOW ROLL

TWO INSIDE LOOPS

TWO HORIZONTAL ROLLS

TOP HAT

TWO OUTSIDE LOOPS

SQUARE LOOP ON CORNER

INVERTED FLIGHT

STALL TURN, $\frac{1}{4}$ rolls

CUBAN EIGHT

TWO TURN SPIN

DOUBLE IMMELMAN

SLOW ROLL

TWO INSIDE LOOPS

TWO HORIZONTAL ROLLS

TOP HAT

TWO OUTSIDE LOOPS

SQUARE LOOP ON CORNER

INVERTED FLIGHT

STALL TURN, $\frac{1}{4}$ rolls

CUBAN EIGHT

TWO TURN SPIN

DOUBLE IMMELMAN

SLOW ROLL

TWO INSIDE LOOPS

TWO HORIZONTAL ROLLS

TOP HAT

TWO OUTSIDE LOOPS

SQUARE LOOP ON CORNER

INVERTED FLIGHT

STALL TURN, $\frac{1}{4}$ rolls

CUBAN EIGHT

TWO TURN SPIN

DOUBLE IMMELMAN

SLOW ROLL

TWO INSIDE LOOPS

TWO HORIZONTAL ROLLS

TOP HAT

TWO OUTSIDE LOOPS

SQUARE LOOP ON CORNER

INVERTED FLIGHT

STALL TURN, $\frac{1}{4}$ rolls

CUBAN EIGHT

TWO TURN SPIN

THE SPORTSMAN MANOEUVRES

Points from 0 to 10 are awarded for each manoeuvre and then multiplied by the K - factor (difficulty factor). It is recommended that once all the manoeuvres can be flown

competently, the higher K - factor manoeuvres should be perfected first as this results in higher total scores being achieved. Each competitor has ten minutes in

Don't forget: ALL MANOEUVRES BEGIN AND END WITH A STRAIGHT & LEVEL line of flight OF TWENTY TO THIRTY METRES

And note: IT IS THE trajectory OF THE MODEL'S Centre of Gravity THAT IS JUDGED, NOT ITS' attitude IN FLIGHT

1. TAKE OFF SEQUENCE K1

After release, model accelerates parallel to the runway, takes off, maintains a straight line of flight for a reasonable distance (about 50 metres) while it gains altitude, then turns 90 degrees away from the runway, still gaining height

Downgrades:

Model not 'aimed' parallel to the runway, and ESPECIALLY for veering closer during the acceleration / take off / climb out, because safety of any person at the upwind line must be ensured at all times

Model not being fully controlled during the sequence, evidenced by lines not really straight, and lack of gracefulness and smoothness

2. DOUBLE IMMELMAN K2

Model flies straight and level (past the centreline) pulls up to perform half an inside loop followed immediately by a half-roll, flies a straight line, then performs a half outside loop followed immediately by a half-roll, and another straight line to exit

Downgrades:

Half loops not round and of the same size.

Horizontal lines (including rolls) not the same length as the vertical lines

Change of heading during loops, straight lines and half rolls.

Half rolls not immediately after half loops.

Exit line at different heading and or altitude to entry line.

3. SLOW ROLL K3

Model establishes an entry line, and then rolls slowly through one revolution taking approximately five seconds.

Downgrades:

Roll rate not constant during roll.

Changes in heading or altitude.

Model does not roll exactly 360 degrees.

Roll is completed in less than four seconds.

Exit line at different heading or altitude to entry line.

4. TWO INSIDE LOOPS K3

Model establishes an entry line then performs two consecutive inside loops.

Downgrades:

Wings not level at the top and bottom of the loops.

Changes in heading during loops.

Loops not round.

Loops not superimposed.

Exit line at different heading or altitude to entry line.

5. TWO HORIZONTAL ROLLS K3

The model establishes an entry line then performs two consecutive horizontal rolls at a uniform rate of roll.

Downgrades:

Changes in heading and or altitude during rolls.

Roll rate not constant.

Model does not do exactly two rolls.

Exit line at different heading or altitude to entry line.

6. TOP HAT K3

From a straight & level entry line, quarter loop to a vertical flight path, fly a straight line, then perform a half-roll, fly a straight vertical line, quarter-loop to a horizontal flight path; fly an inverted straight line, then a quarter-loop to a vertical flight path, fly a straight line, half-roll, followed by a straight vertical line, then a quarter-loop to recover to a straight and level exit line.

Downgrades:

Changes in heading during quarter loops and/or straight lines.

Changes in heading during half rolls.

Quarter loops not of the same radius.

Vertical lines not of the same length.

Half rolls not at the same roll rate.

Exit line at different heading or altitude to entry line.

7. TWO OUTSIDE LOOPS from the top K4

Model establishes an entry line then performs two consecutive outside loops.

Downgrades:

Wings not level at the top and bottom of the loops.

Changes in heading during loops.

Loops not round.

Loops not superimposed

Exit line at different heading or altitude to entry line.

8. SQUARE LOOP ON CORNER K3

The model establishes a straight and level entry line, then starting from the centre-line, part-loops to establish a 45-degree climbing line, then part-loops through 90-degrees to a new 45-degree climbing line. At the centreline the model part-loops through 90-degrees to a 45-degree inverted diving line at reduced power; model part-loops through 90-degrees to a new 45-degree diving line, model part-loops to recover in straight and level flight at the centre-line, and flies a straight and level exit line.

Downgrades:

Climbs and dives not at 45 degrees.

Up/down lines not all the same length.

Exit line at different heading or altitude to entry line.

Part loops not all the same radius.

Model corkscrews in or out.

9. STRAIGHT INVERTED FLIGHT K2

From a straight and level entry line of flight, model rolls to inverted then flies a straight and level inverted flight path of five seconds then half rolls back to level flight and then flies a straight and level exit line.

Downgrades:

Changes in heading and or altitude during level flight.

Inverted flight less than three seconds.

Roll rates not the same for both rolls

11. STALL TURN, with half rolls up and down K2

From a straight and level entry line of flight, model quarter-loops to a vertical upline (on the centreline) of a length chosen by the pilot, quarter-rolls (either direction) and continues the vertical upline for the same chosen length. Power is reduced (perhaps to idle) near the top of this upline so the model ceases climbing. As the model is coming to a halt, rudder is applied so the model will stall-turn into the wind, pivoting about its' C of G. Enough power is re-applied (if required) to 'blow' the tail over; the power reduced again and the model is then flown in a vertical down-line. At the same height as the first quarter-roll, perform a second quarter-roll in the direction that will bring the model out upright, then continues the downline, recovering in level upright flight at the same height and heading as the entry line of flight.

Downgrades:

Up and down lines not truly vertical.

Quarter rolls not in the middle of the up and downlines

Roll rates not the same

Quarter-loops not the same radius

Entry / exit lines not at the same height and heading

Stall turn more than one and a half wingspans in radius

Pendulum action after the stall turn. A flop forward or backward is a zero

11 CUBAN EIGHT K3

Model flies straight and level past the centre and then pulls up to perform a part inside loop. When at 45 degrees, inverted, model flies a straight line then performs a half roll, followed by a straight line; then performs another part inside loop and again when at 45 degrees inverted, flies a straight line, then performs a half roll, then another straight line and then a part inside loop to recover in straight and level flight.

Downgrades:

Part loops not round and of the same size.

Changes in heading during loops, straight lines and half rolls.

Half rolls not superimposed.

Exit line at different heading or altitude to entry line

12. TWO TURN SPIN K2

Model establishes an entry line, power is reduced and model is held in a nose high attitude until it stalls and commences to spin. Model auto rotates through two complete turns, then flies a straight vertical down-line, then performs a quarter loop to a straight and level exit line.

Downgrades:

Wings not level during entry and exit line.

Model climbs during entry line (a nose-high attitude is required, not a climb)

Wingover on entry. Snap entry scores zero

Over or under-turning: 1 point off for each 15 degrees of over or under-rotation.

Exit line at a different heading than entry line.

Model not stalled during spin (e.g. spiral dive) scores zero.

13. LANDING SEQUENCE K1

Model turns onto an upwind line parallel with the runway, and maintains a descending line until about to touch down, when the model is flared. The model settles onto the runway, maintaining a line parallel to the runway, until it stops.

Downgrades:

Approach line not parallel to runway

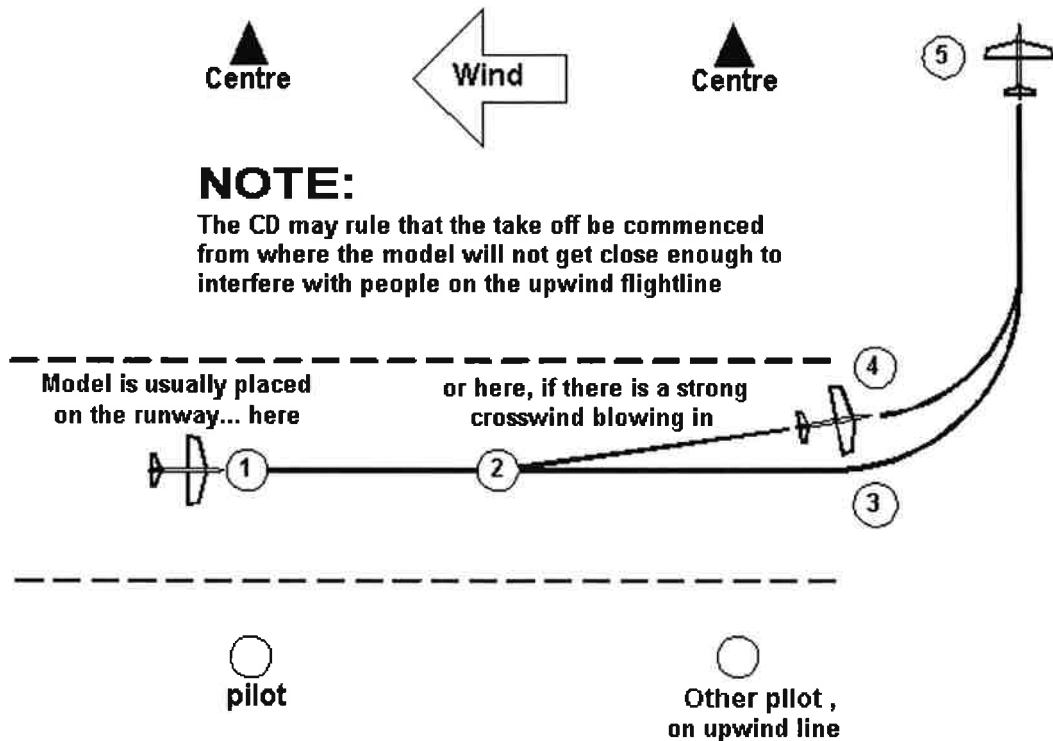
Gallops of elevation in approach line

Smoothness and gracefulness lacking in the approach and landing

Model allowed to point at pits / judges / people with motor running after landing

Model is not controlled until it is physically restrained

1. THE TAKE OFF SEQUENCE



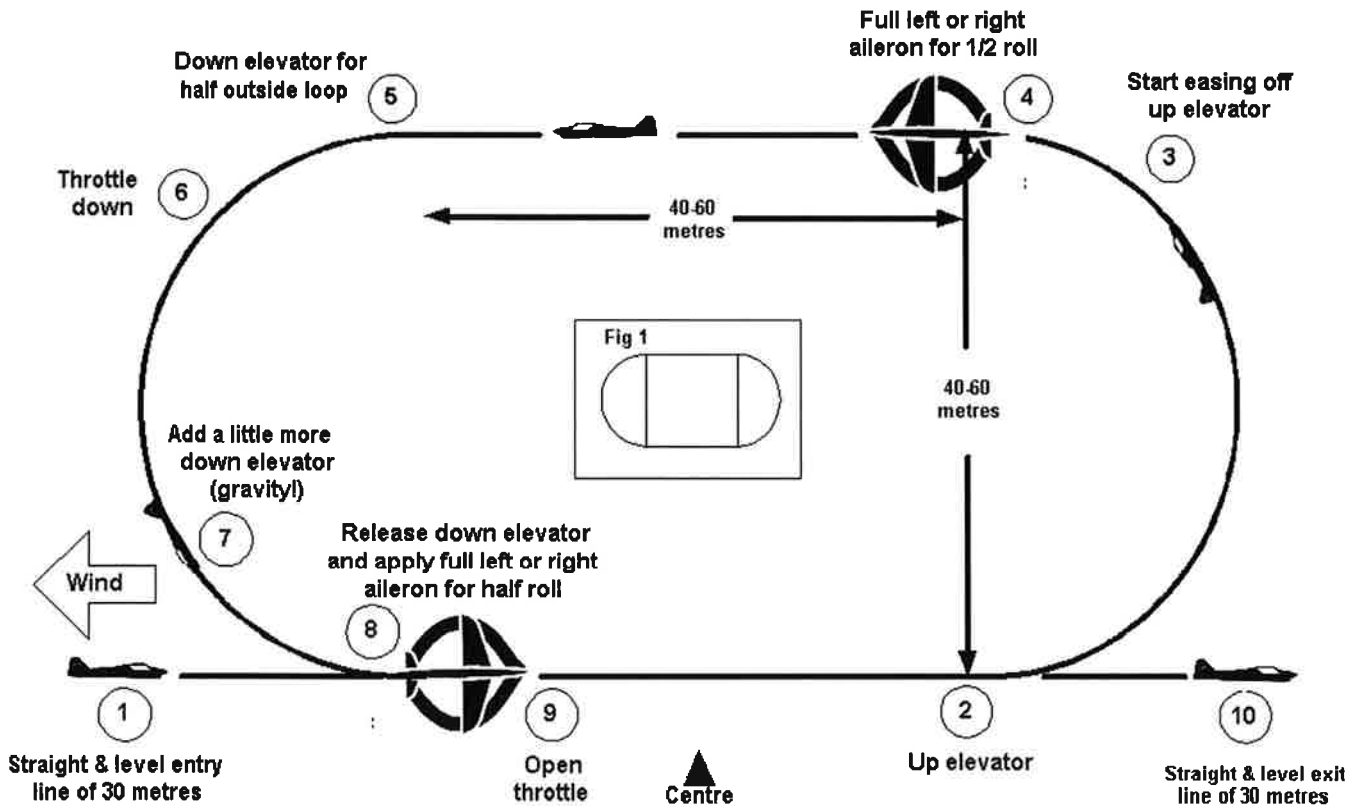
How To:

1. The aim is to demonstrate proper control of the model during the take off sequence, safety being paramount
2. The model is usually placed on the runway by your caller or other helper, approximately in front of you
3. **NOTE:** The Contest Director (CD) may, for any safety reason, rule that for any class the downwind pilot's model be placed on the runway in some other place, often between the two pilots, such as position 2, or even in front of the upwind pilot. This is to reduce any chance of the downwind pilot steering or flying the model into anyone on the upwind line, especially if the pilots are positioned close to a narrow runway, and/or there is a strong crosswind blowing in
4. The Take Off begins when the model starts to move forward. Ideally, the model stays parallel to the runway as it accelerates, takes off, and ascends to a reasonable height to position 3, say, 50 metres upwind
5. The model is turned away 90 degrees at position 3, and flies an ascending line perpendicular (at a right-angle) to the strip
6. The CD may also rule before-hand that a take off heading that deviates away from the upwind pilot, such as to position 4, is allowable without downgrade
7. The Take Off finishes at position 5

Watch for:

1. The model is not kept parallel to the runway during acceleration. However, maintaining a smooth, straight line that deviates away from the pilots may be deemed as being even desirable in a strong crosswind, and not cause for downgrading
2. The model oscillates from side to side during acceleration
3. The model does not rise smoothly into the air
4. The climb after take off is not maintained at a reasonable angle, especially too steep
5. The turn away at 3 or 4 is not performed smoothly, and/or with gallops in elevation
6. The climb out to position 5 is not perpendicular to the runway
7. Taking off in such a manner that causes the judges to believe that people's safety is being compromised, is a sure-fire way to get a score of zero for the take off!

2. DOUBLE IMMELMAN



How To:

Flying Straight and level: -

1. Apply up elevator for rounded half loop
2. Ease off on the elevator as you approach the top of the half loop
3. An instant before the half loop is completed, release the elevator and apply full left or right aileron for a half roll to normal level flight. Hold heading on opposite course to entry for the same distance as the diameter of the half loop. Throttle down
4. Apply down elevator to perform half an outside loop the same diameter as the previous inside loop
5. When flying inverted at the bottom, do a half roll (left or right) to normal upright flight
6. Open throttle and fly straight and level for about 20 or 30 metres
7. **The manoeuvre should have the same shape as in Fig. 1. (half loops attached to each side of a square)**

Watch for:

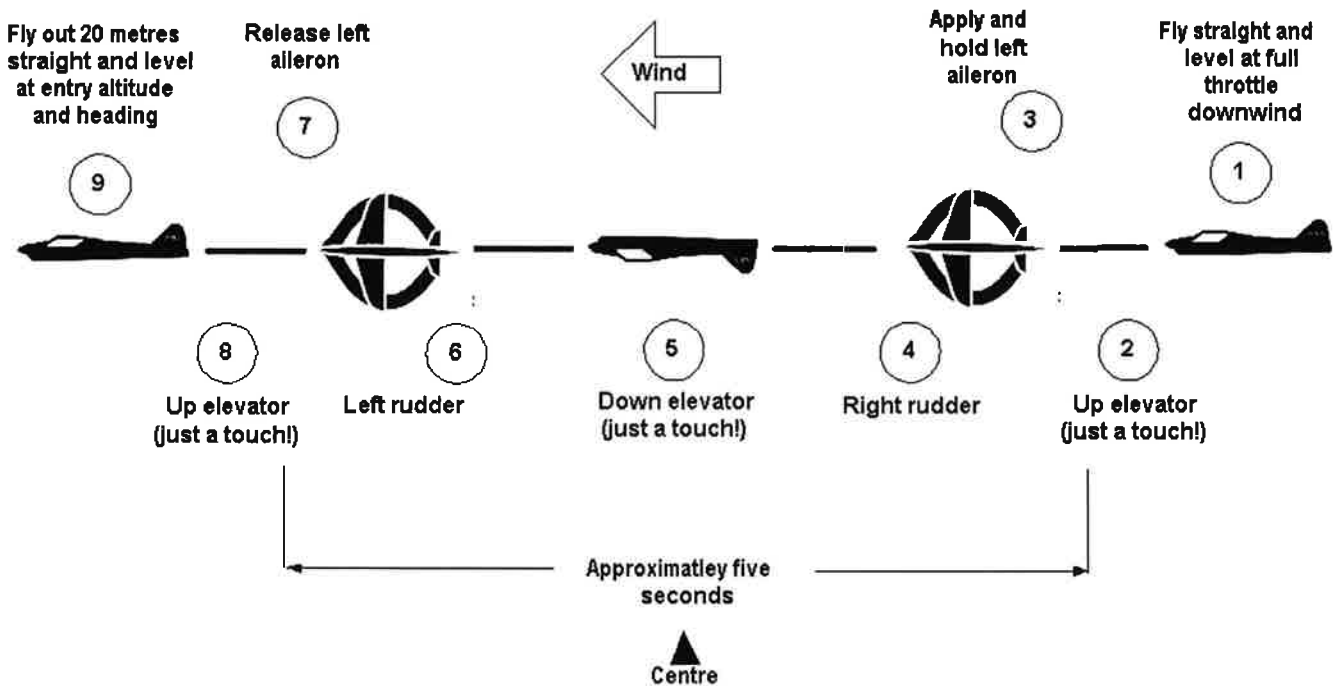
1. Centring of the manoeuvre (half loops equal distance each side of centre-line / pilot)
2. Model should be flying straight and level before and after manoeuvre
3. Each half loop must finish directly above or below its' starting point to be a correctly rounded half - loop
4. Half rolls should commence immediately as the half loop concludes (no visible line between loop and roll)
5. Half rolls must be of the same roll rate
6. Entry and exit lines not at the same height or heading

3. SLOW ROLL

Note:

A slow roll to the left is described below.

For a slow roll to the right, reverse all roll and rudder inputs



How to:

Flying straight and level: -

For a roll to the left...

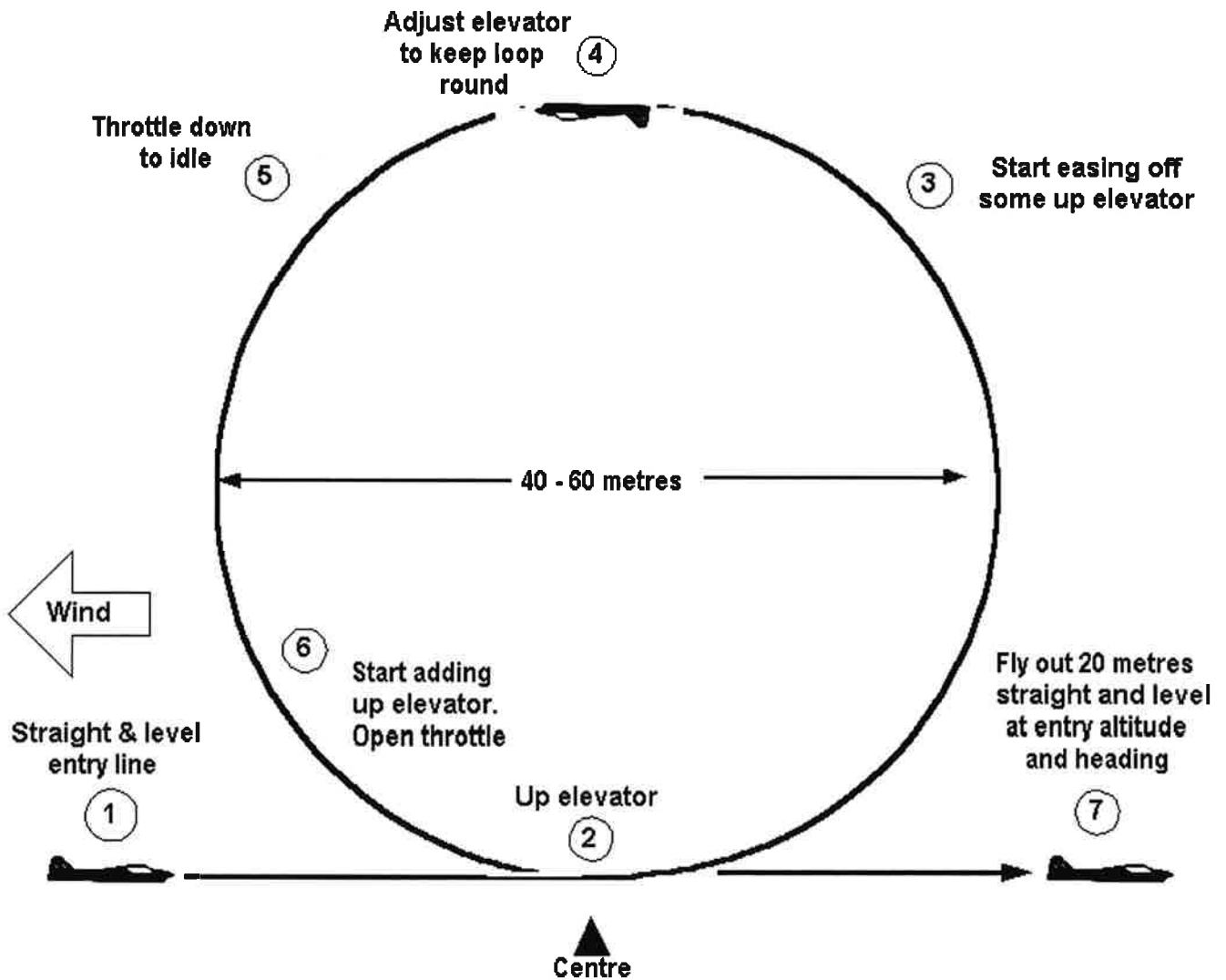
1. Apply enough left aileron to put the model into a continuous roll that will last for about five seconds. (See trimming chart).
2. As the wings become vertical (knife edge) apply right rudder to keep the nose up (rudder is now acting as elevator).
3. Ease off the right rudder as the plane leaves Knife-edge flight and apply some down elevator to keep the nose level as the plane approaches inverted flight.
4. Release the down elevator as the plane leaves inverted flight and apply some left rudder to keep the nose level as the plane approaches Knife-edge flight.
5. Ease off the left rudder as the plane leaves Knife-edge flight. Release the left aileron as the wings become level. Fly straight and level for about 20 metres

Watch for:

1. Manoeuvre is centred (model is inverted directly in front of pilot).
2. Roll rate is constant. Application of rudder may slow down or increase the roll rate.
3. Height and heading are maintained.
4. The slow roll should take approximately 5 seconds to complete
5. Entry and exit lines not on the same line of flight

To do a slow roll to the right, reverse all the aileron and rudder control inputs

4. TWO INSIDE LOOPS



How To:

Flying straight at full throttle:

1. Apply up elevator to form a loop of between 40 to 60 metres in diameter.
2. As the model approaches and passes through the top (highest point) of each loop, ease off the up elevator (gravity is helping). Only when on the way down, reduce the throttle to keep air speed constant.
3. At the bottom of each loop, squeeze a little extra up elevator (to allow for the effect of gravity) to maintain constant shape.
4. Just before the bottom of the loop go back up to full throttle.
5. Repeat for the second loop
6. At the conclusion of the second loop ease off elevator to exit in straight and level flight

Throttle up and fly straight & level for 30 metres

Watch for:

1. Highest point and lowest point for each loop must be directly in front of the centre-line / pilot.
2. Loops must appear round, and thus not 'segmented' by changes of radius
3. Each loop must appear to be the same shape and size and be in the same place in the sky.
4. Model must not corkscrew in or out
5. Wings should be parallel to the ground at the top and bottom of each loop
6. Entry and exit lines not on the same line of flight

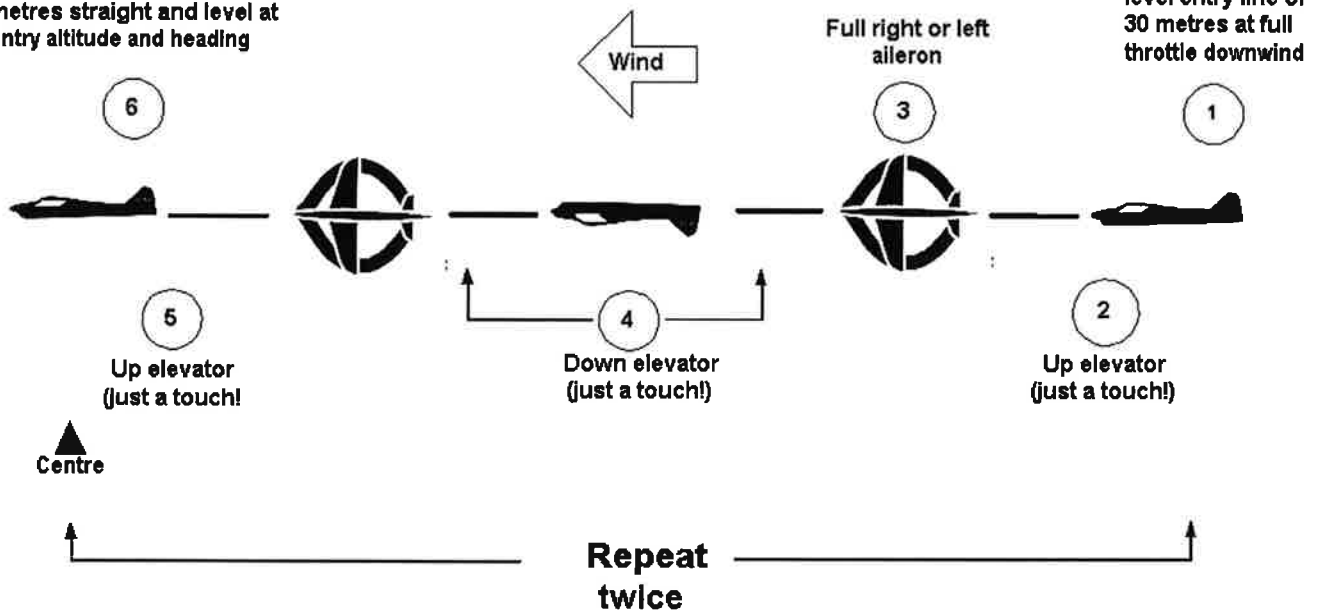
5. TWO ROLLS

Note:

For your first tries, you should put the model in a say, 15 degree climb before you start the rolls ... Insurance !

After the 2nd. roll, fly out 30 metres straight and level at entry altitude and heading

Fly straight and level entry line of 30 metres at full throttle downwind



How to:

Flying straight and level on full throttle

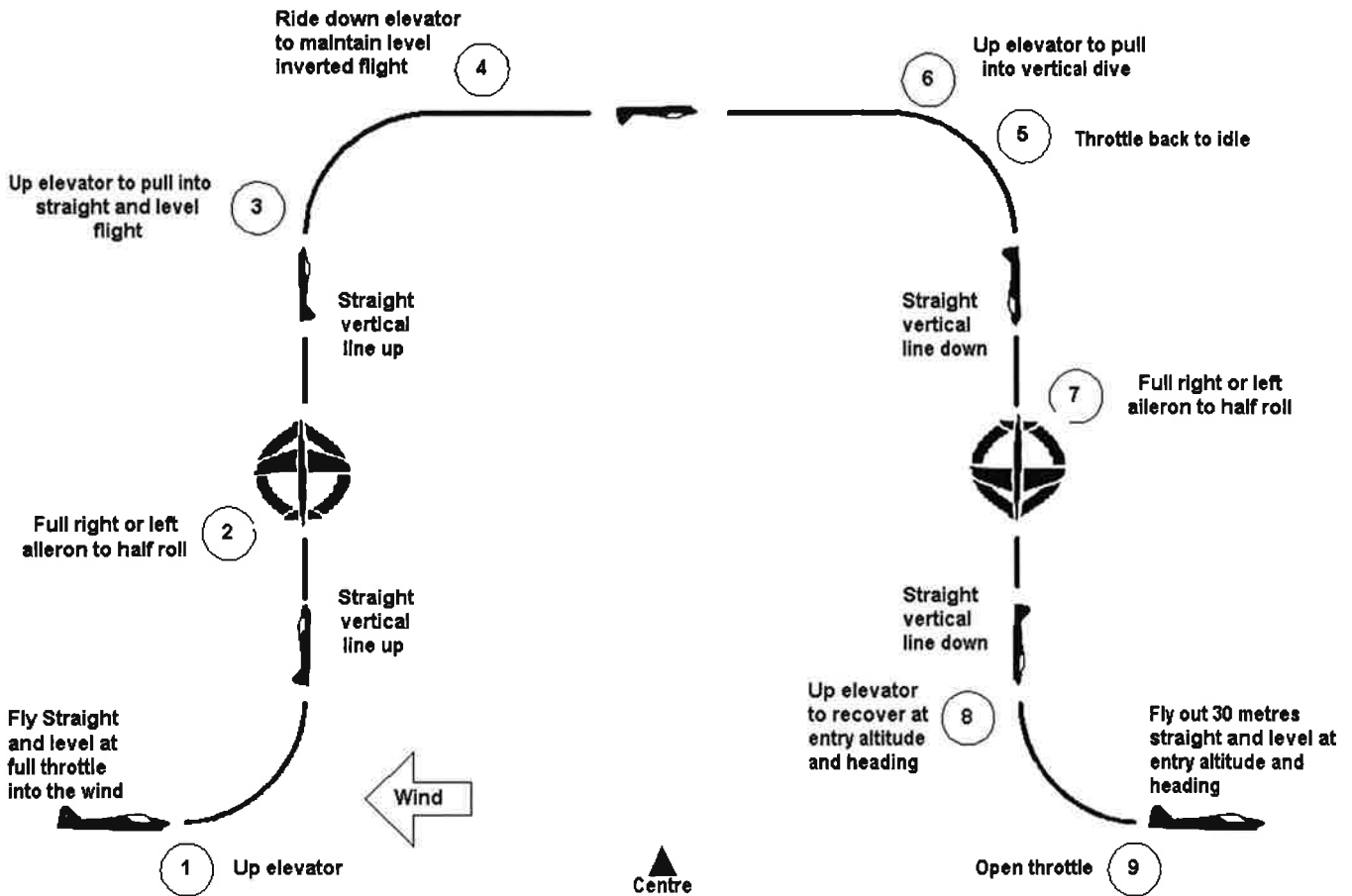
1. Squeeze a touch of up elevator to raise the plane's nose – just a little!
2. Immediately apply full right or left aileron. (See trimming chart to set roll rate) Don't roll so fast that the manoeuvre looks rushed. You must roll slow enough that there is time to effectively maintain a straight line (with no dips or porpoises!) using the elevator
3. As the model passes through the inverted position, squeeze in any down elevator as required, to maintain level flight. Release the down elevator as the plane rolls past the inverted point.
4. As the plane returns to normal upright position, squeeze in some up elevator if required to maintain level flight.
5. Repeat for the second roll, with no pause or change in roll rate.

Watch for:

1. The end of the first & start of the second roll should be directly in front of the pilot.
2. Roll rate should be constant.
3. Manoeuvre should take approximately five seconds to complete (that is, it should not look rushed).
4. Heading should be maintained throughout.
5. Model should not pause or change direction
6. Model should not porpoise because of excessive use of elevator
7. Entry and exit lines not on the same line of flight

Fly straight and level for 20 or 30 metres

6. TOP HAT



How to:

Flying straight and level on full throttle

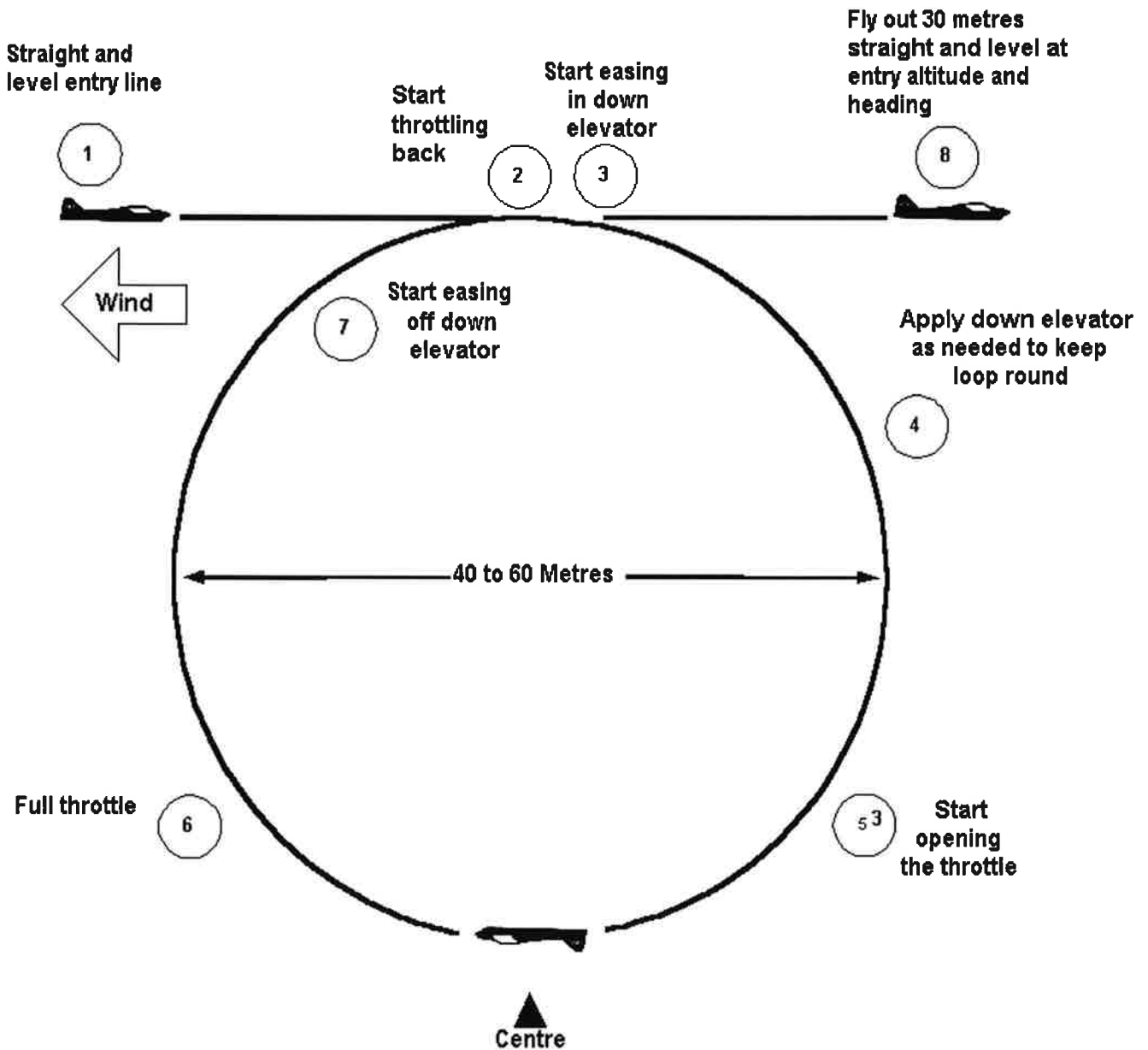
1. Apply up elevator; perform a quarter-loop to pull up into a vertical climb.
2. Half way up of the vertical leg apply full right or left aileron to perform a half roll.
3. Maintain the vertical climb until the top of vertical leg is reached, then apply up elevator to quarter-loop to level inverted flight. Ride down elevator as required.
4. Reduce throttle setting as the plane completes inverted leg.
5. Apply up elevator to enter a vertical dive.
6. At the same height as the exit of the half roll in the upward leg, apply full right or left aileron and perform a half roll.
7. Maintain the vertical dive until the model is at the height where the first quarter-loop ended.
8. Apply up elevator to quarter-loop and pull out at the same height and heading as the model entered the manoeuvre.
9. Open the throttle

Fly straight and level for 20 to 30 metres

Watch for:

1. Manoeuvre is centred
2. Up and down lines not truly vertical before and after half rolls
3. Half rolls must be exactly 180 degrees
4. Half rolls must occur at the same height
5. Entry and exit height and heading must be the same.
6. Inverted flight must be straight and level.
7. Each leg is of same length (the top line is the same length as each vertical line)
8. Entry and exit lines not on the same line of flight

7. TWO OUTSIDE LOOPS



How to:

Flying straight and level at a safe altitude:

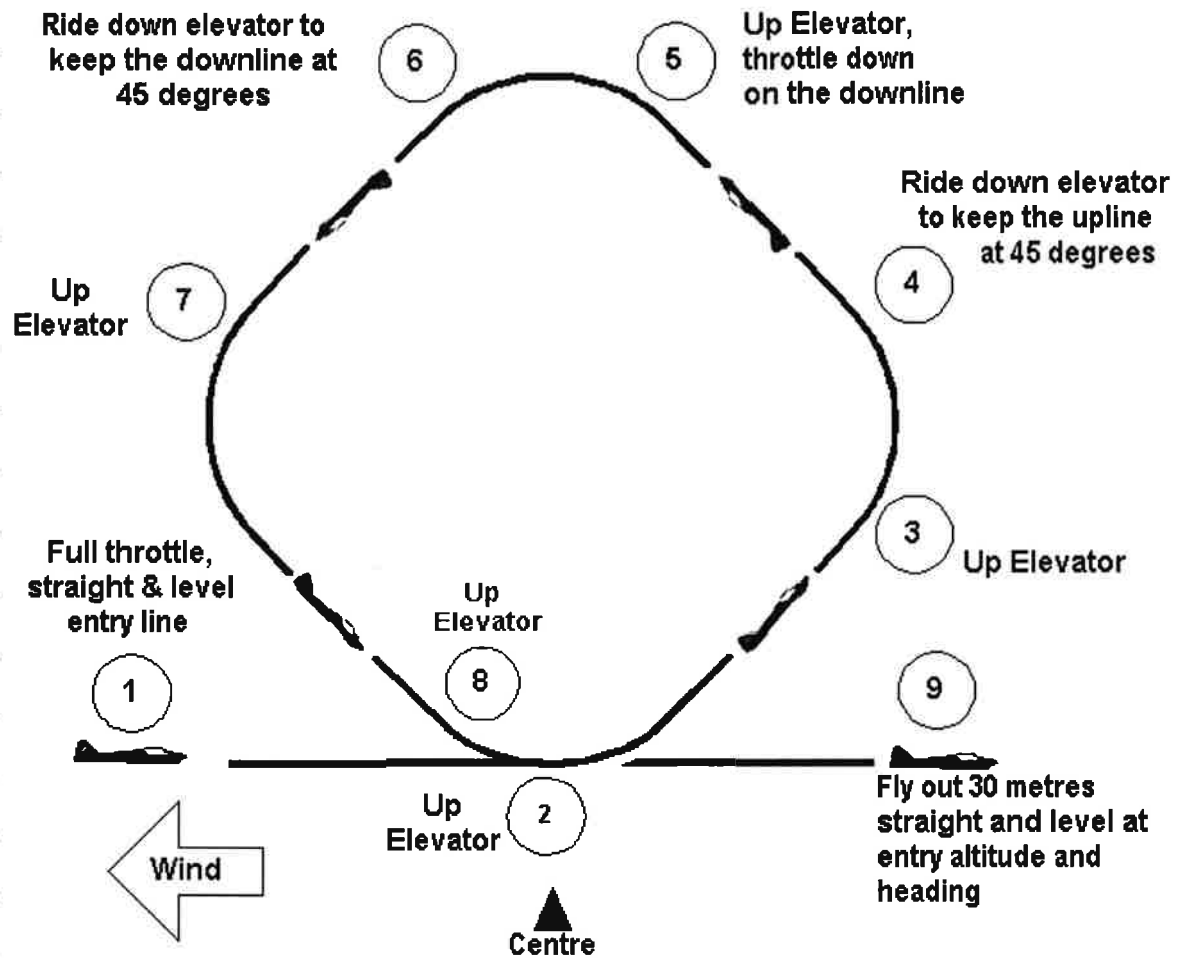
1. Throttle back.
2. Apply down elevator to commence loop.
3. open throttle as model completes first third of outside loop
4. Ease off down elevator as plane reaches top of loop.
5. As second loop is nearing completion slowly release down elevator so that plane leaves the last loop at the same height and heading as it entered the first loop

Fly straight and level for 30 metres

Watch for:

1. Highest point and lowest point of each loop must be directly in front of the pilot
2. Loops must appear round.
3. Each loop must appear to be the same size and in the same place in the sky...!
4. Wings should be parallel to the ground at the top and bottom of each loop
5. Exit point is the same height and heading as the entry point
6. Entry and exit lines not on the same line of flight

8. SQUARE LOOP ON CORNER



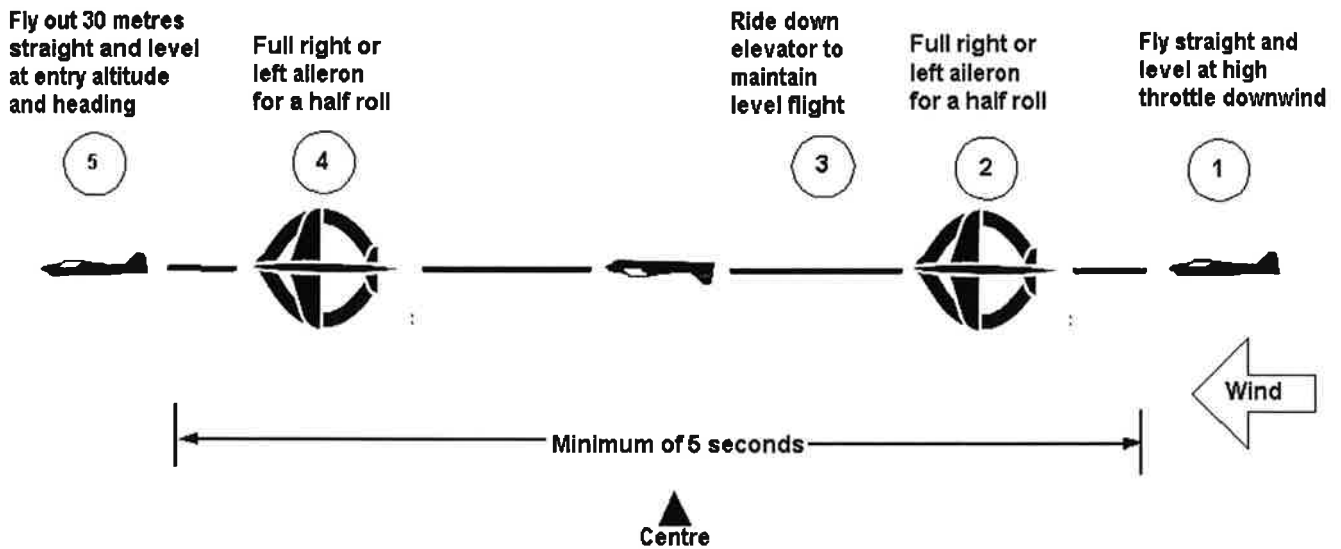
How to:

1. The model establishes a straight and level entry line at full throttle.
2. Apply elevator at the centre line to establish a 45-degree climb.
3. Apply elevator to pull the model through 90-degrees to a new 45-degree climb.
4. At the centre line apply elevator to pull model through 90-degrees to a 45-degree inverted dive. Lower throttle.
5. Apply elevator to pull the model through 90-degrees to a new 45-degree dive.
6. At the centre line apply elevator to exit.
7. Open throttle,
Fly straight and level for 30 metres

Watch for:

1. The manoeuvre is central at the bottom and top.
2. Climbs and dives are at 45 degrees.
3. Side corners are at the same height.
4. All radii the same and each leg the same length.
5. Entry and exit lines not on the same line of flight
6. Model does not corkscrew in or out.

9. INVERTED FLIGHT



How to:

Flying straight and level on full throttle:

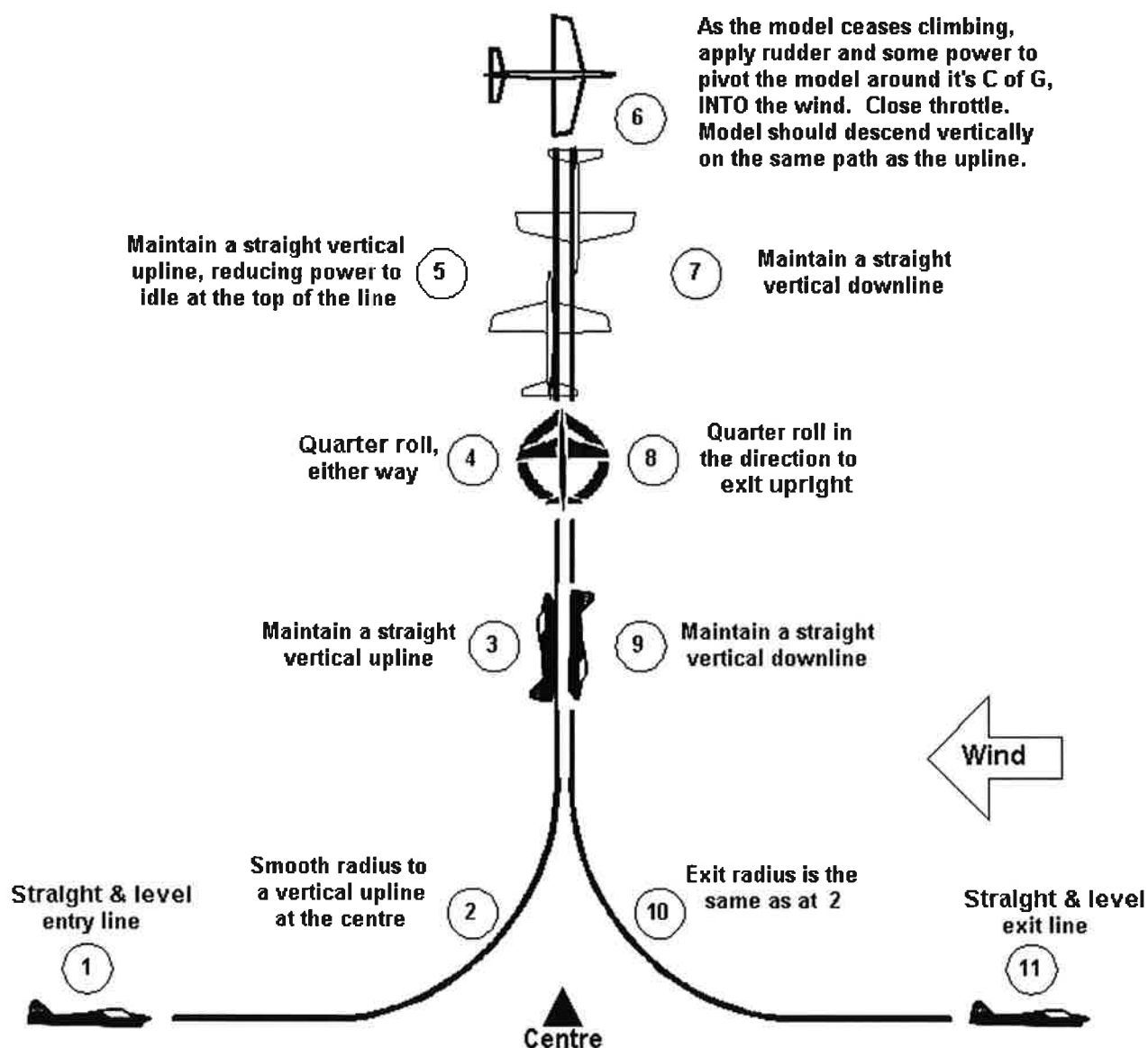
1. Apply right or left aileron to half roll into inverted position
2. Hold wings level with aileron and maintain height with down elevator
3. Apply right or left aileron to half roll back to normal flight

Watch for:

1. Manoeuvre must be centred on pilot
2. Inverted flight lasts for at least five seconds
3. Model does not stray from straight and level flight whilst inverted
4. Model is level at both entry and exit of inverted flight
5. Straight and level lines of at least twenty or thirty meters before and after the half rolls
6. Entry and exit lines not on the same line of flight

Fly straight and level for 30 metres

10. STALL TURN with ¼ rolls



How to:

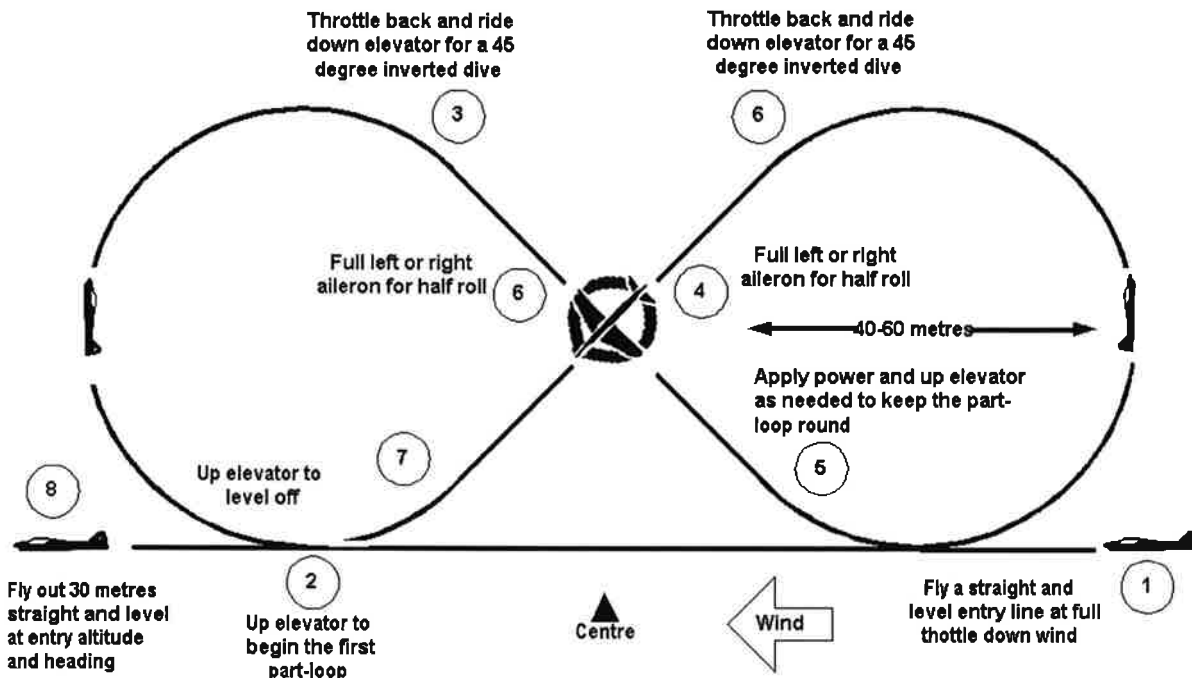
W

From a straight and level entry line of flight at high power:

1. Fly a smooth quarter-loop radius to a true vertical line, wind corrected if required
2. Quarter roll is to be in the middle of the total up line
3. Near the top of the upline, power is reduced and the model ceases rising. Apply full rudder, and some power if required, to pivot the model about its' Centre of Gravity or balance point. Close the throttle
4. Fly a true vertical downline, wind correcting if required
5. Quarter roll at the same height as the first, in the middle of the downline, and at the same roll-rate
6. Exit quarter-loop radius is the same as the entry radius

Fly straight and level for 30 metres

11. CUBAN EIGHT



How to:

Flying straight and level on full throttle:

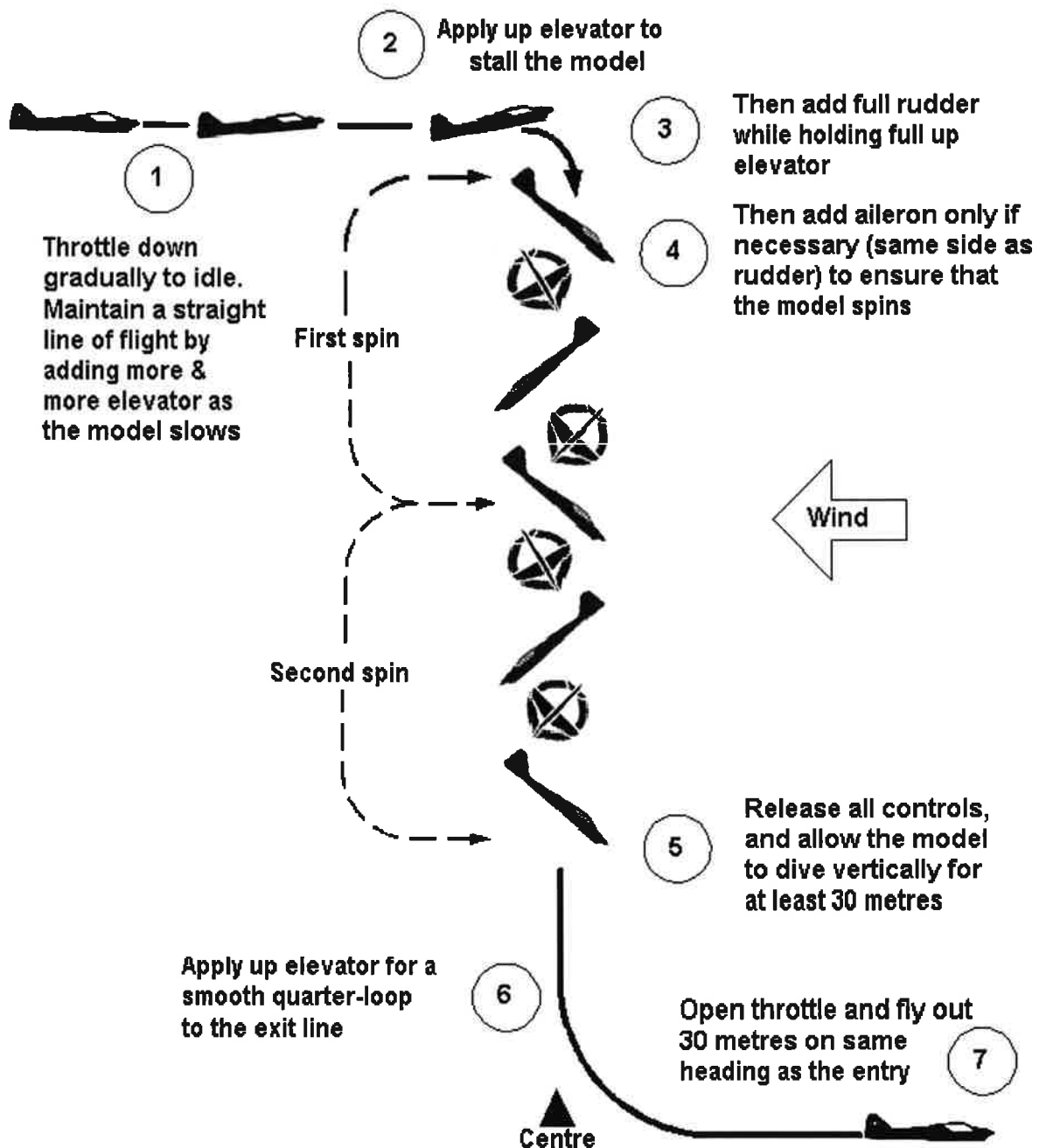
1. Apply up elevator to commence an evenly rounded part-loop.
2. Ease off the elevator and then the throttle to enter 45 deg. Inverted dive. Ride down elevator as required, to maintain the 45 deg. Line.
3. Apply full right or left aileron for a half roll at the height of the radius of the entry part-loop (whew!) and continue with 45-degree dive. Ride up elevator as required.
4. Open the throttle and Apply up elevator to perform another part-loop the same size as the previous part-loop, and starting at the same entry height
5. Ease off elevator and throttle to enter 45 degree inverted dive. Ride the elevator as required.
6. Apply full right or left aileron for a half roll at the height of the radius of the entry part-loop and continue on with the 45-degree dive. Ride the elevator as required.
7. Apply up elevator to enter level flight at the same height and heading as the entry and open throttle

Fly straight and level for 30 metres

Watch for:

1. Ensure the centre of both half rolls are directly in front of the pilot and are at the same height.
2. Half rolls to be at the centre of each down line
3. Roll rate the same for each half roll
4. Down lines are at 45 degrees
5. Both the half loops must be the same size and shape and start at the same height.
6. Entry and exit lines not on the same line of flight

12. TWO TURN SPIN



How to:

Flying straight and level on reduced throttle:

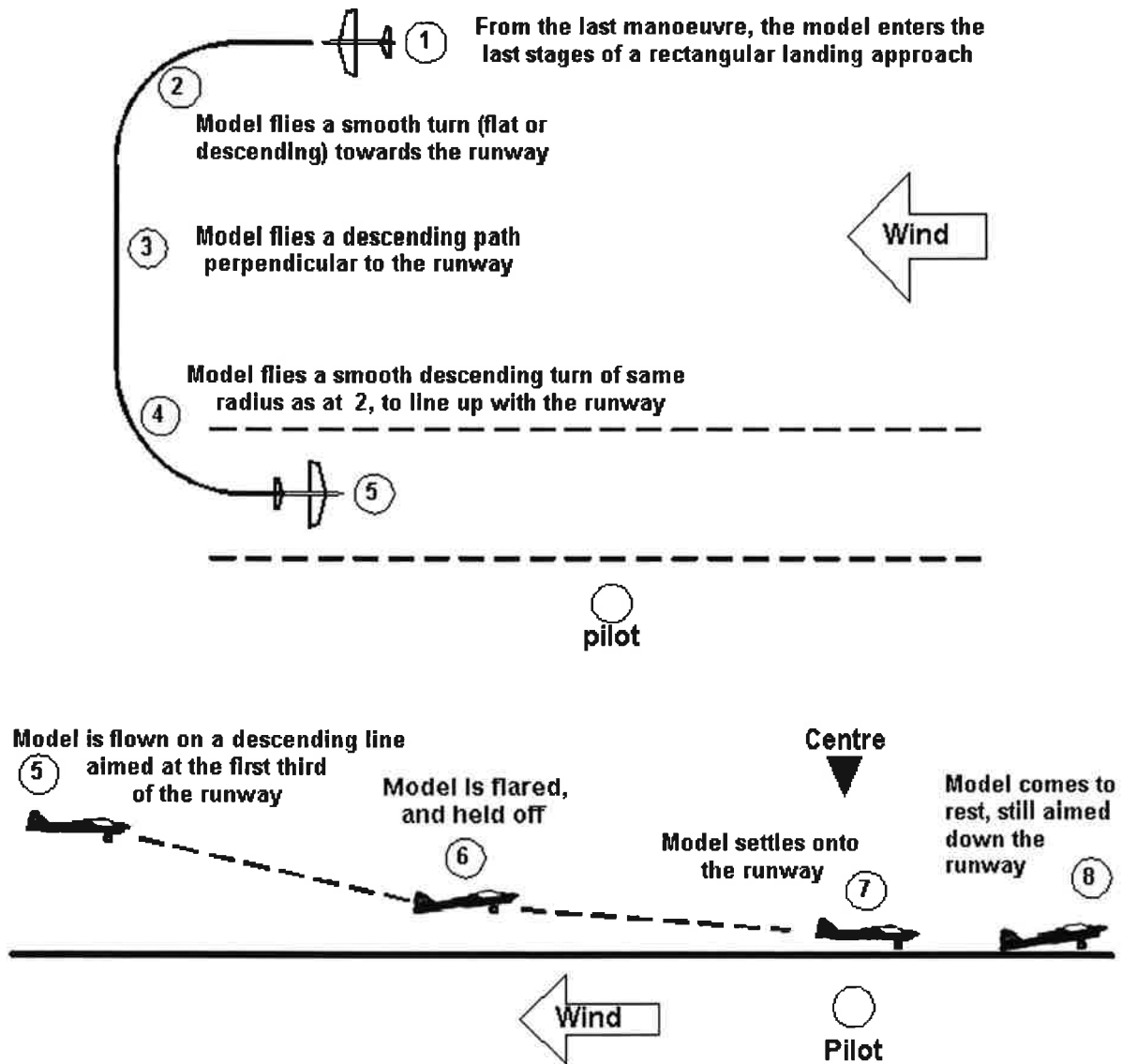
7. Throttle back to idle to slow model down
8. Apply increasing up elevator at the centre line to increase the angle of attack and stall aircraft (model should not climb at all)
9. Add rudder to begin the spin (and ailerons if necessary, to ensure the model spins)
10. Allow the aircraft to auto-rotate through two complete spins
11. Release all controls, allow model to dive vertically
12. Apply up elevator to re-establish level flight
13. Apply throttle

Watch for:

10. Spins not centred directly in front of the pilot
11. Entry and exit lines should be straight and level (on the same line of flight) though at different heights
12. Model yaws into wind at spin entry. One point downgrade for each 15 degrees of yaw. Model must maintain a straight line until it stalls.
13. If the model does not stall, or is snap-rolled into the spin, the score is zero
14. Exactly two spins should be made. One point downgrade for each 15 degrees of over or under-rotation
15. Where the aircraft does not remain stalled during the spins (e.g.: spiral dive) scores zero.

Fly straight and level for 30 metres

13. APPROACH & LANDING



How to:

1. The aim is to demonstrate proper control of the model during approach and landing, safety being paramount
2. Turns to be the same radius. Ideally, the turn at 2 may be a shallow turn, and the turn at 3 may be slightly steeper; but the turns don't *have* to be descending
3. The descent angle of leg 3 is used to position the model in height in preparation for the turn at 4 and the beginning of the landing itself at position 5
4. From the end of the turn at 4, at position 5, the model is flown on a descending path parallel to the runway and which would coincide with the runway at about the first third of the runway's length
5. When about half a metre from the runway surface, the model is flared and held off (hold the nose up a little) to bleed off excess speed. The model settles onto the runway without bouncing
6. Ideally, the model comes to rest before the second third of the runway's length, and still parallel with the runway
7. Wait until your helper restrains the model before ceasing to control the model by radio

Watch for:

3. Turns not the same radius
4. Allowing the model to climb at any point in the approach & landing demonstrates a lack of control
5. The leg at 3 is not flown perpendicular (90 degrees) to the runway
6. The model landing unreasonably short or long down the runway, shows lack of control
7. Model should not bounce upon landing, but judges may make allowance for rough strips
8. Model is to come to rest still aimed down the runway
9. If the pilot attempts to taxi the model back, and in doing so aims the model at the pits, judges or other people, the landing may be zeroed if the judges believe people's safety is being compromised
10. Collapsing the transmitter antenna or turning the Tx off while the model is unrestrained and the motor is still running, scores zero

Trimming Step

Maneuver to Perform

What to Look For

How to Fix It

1 **Center of Gravity** Crosswind, 45° up-line, roll inverted

- Nose rises towards the sky
- Nose gently falls
- Nose falls too quickly

Add nose weight, C.G. is aft
You're in the zone
Add tail weight, C.G. is forward

Notes:

2 **Lateral Balance** Vertical down-line and pull to level flight

- Wings are not level

Add weight to the high wing tip

3 **Right Thrust Angle** Upwind, vertical up-line

- Model drifting to the left

Add right thrust

4 **Up Thrust Angle** Crosswind, horizontal line, slow from a high speed

- Model pitches upward
- Model remains level and descends
- Model pitches downward

Add upthrust, remove up elevator trim
You're in the zone
Add downthrust, remove down elevator trim

5 **Aileron Differential** Upwind, 45° up-line, apply full Right aileron

- "Walking" to the Right
- "Walking" to the Left
- "Walking" to the Left
- "Walking" to the Right

Decrease downward travel on left aileron
Decrease upward travel on right aileron
Decrease downward travel on right aileron
Decrease upward travel on left aileron

6 **Throttle → Aileron** Upwind, vertical down-line
Horizontal line, slow from a high speed

- Rolls to the Right

Use left aileron at low throttle (2% to 5%)

7 **Throttle → Rudder** Upwind, vertical down-line

- Yaws to the right

Correct with mix at 1/2 throttle or less

8 **Rudder → Aileron** Flat Rudder Turn to the Left

- Rolls Left (proverse roll)
- Rolls Right (adverse roll)
- Rolls Right (proverse roll)
- Rolls Left (adverse roll)

Correct with a linear mix (2% to 5%)

Flat Rudder Turn to the Right

9 **Rudder → Elevator** Flat Rudder Turn

- Pitches Up
- Pitches Down

Correct with a curve mix (2% to 10%)

10 **Downline Mix** Crosswind, vertical down-line

- Model pitches up

Add 2% down elevator at 0 throttle