Description of the Bronze Wings manoeuvres, with diagrams

INTRODUCTION

You only need a simple model with a 40-ish size engine to be able to perform the Bronze Wings manoeuvres to a satisfactory standard. A low-cost 'stick' type model is adequate for this purpose. Many trainer-type models are also quite capable of all the manoeuvres.

Two Club Instructors are required to be present for the Bronze Wings test. The test can be carried out over 4 consecutive flights on the same day if required. If assistance is required during the test another attempt cannot be made on the same day.

The following pages explain how to approach your practice.

Start by practicing straight and level lines parallel to the runway. At first, do them about 100 to 150 metres out, at about 40 to 50 metres up. Then do them about 40 metres out, and at about 50 metres in altitude. Try to get used to the two different 'lines of flight'… one close, the other further out & higher. Get your mates to tell you whether you're on line or not.

When you feel you're ready to start practicing all the manoeuvres remember that some of them will require you to fly at some distance away from the runway… **NEVER EVER** fly at such a low height that if the motor were to quit, you risk not being able to glide safely back to the runway.

Always fly safely, do not put your model at risk, and don't fly behind yourself.

All manoeuvres start and end with a straight and level line of flight, parallel to the runway, of at least 30 metres. This includes for example, the spin entry and exit lines. All the manoeuvres should be centred in front of you.

For manoeuvres that are in the vertical plane, the correct 'line of flight' is about 100 to 150 metres out, but for manoeuvres 2, 3, 4, 5, 6, and 12, they are on a line of flight only about 40 metres out from the pilot. These are all horizontal plane manoeuvres where your model will spend some time a long way away from you, so start close.

Manoeuvre description and diagrams:

1. Dexterity, Theory and Pre-Flight Checks
2. Taxi Out and Take Off
3. In Flight Trimming
4. Rectangular Approach Circuit
5. Procedure Turn
6. Outward Figure of Eight
7. Inward Figure of Eight
8. Stall and Recover
9. Loop
10. Simulated Dead Stick Landing
11. Approach and Landing
12. Taxi Back and Shut Down the Motor

1. Dexterity, Theory and Pre-Flight Checks

Dexterity
The pilot must be able to locate and identify all transmitter controls without fumbling.

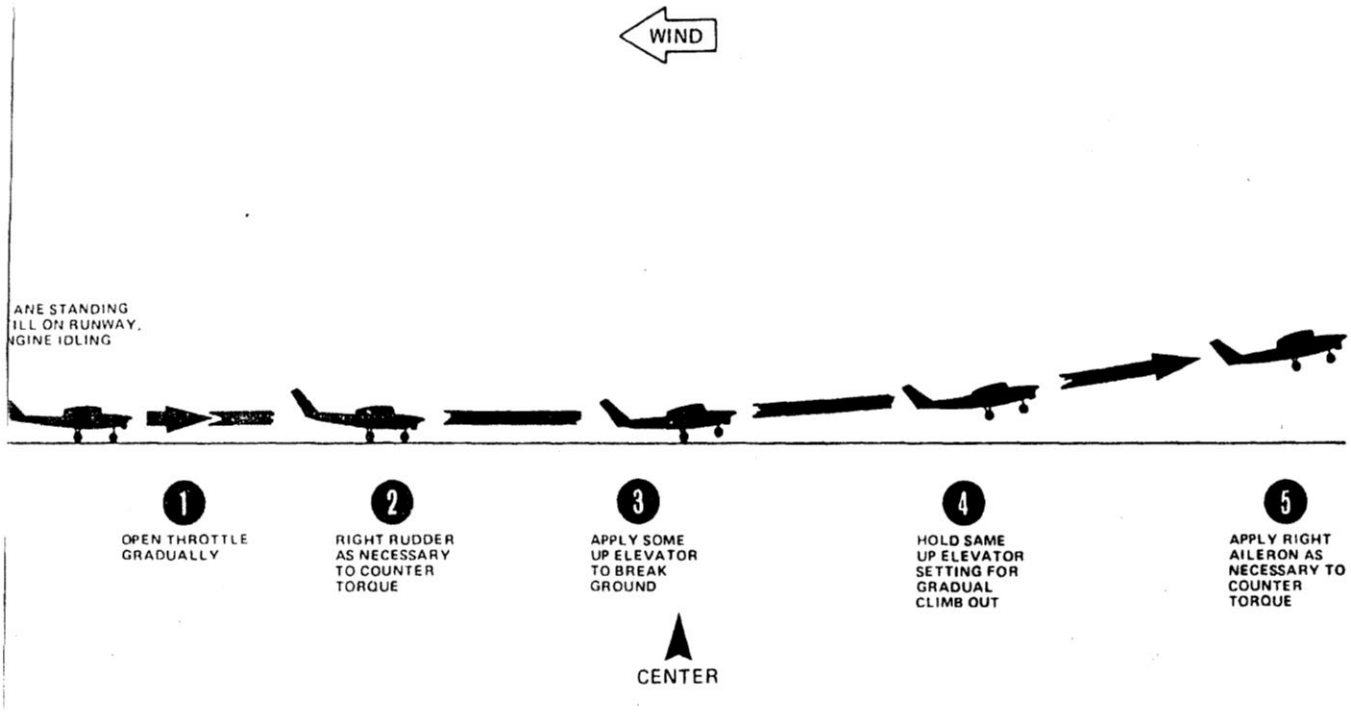
Theory
The Pilot must be able to identify all major components of the aircraft and define functions, including effect of controls, and have a thorough knowledge of safety rules and regulations.

A simple theory test (multiple choice) will also be conducted by the CFI to test your knowledge of the Club Rules, Procedures and Safety requirements.

Pre-Flight Checks
Refer to the “pre-flight checks” identified in the NMAS Induction document under “IC and Electric Pilot Procedures”. In summary, and as given in the MAAA test sheet, the Pilot checks the engine mounting, plumbing (IC), centre of gravity location, security of undercarriage and signs of structural or covering problems that could affect flight, eg; presents of warps which could affect trim. The pilot also checks that the controls are neutral and control throws are correct and checks throttle settings, state of the battery and performs range check.

2 Taxi Out and Take Off

During take-off the pilot demonstrates gradual application of power whilst keeping the aircraft straight, and using a little elevator to lift off, makes a gentle climb out with wings level until safe altitude is reached.



-TAXI OUT AND TAKE OFF.

MANEUVER CONTROL DIAGRAM
(SIDE VIEW)

How to...

Taxiing

- Blip the throttle to keep the model moving.
- Place the model on the end of the runway facing into the wind ready for the take off roll.

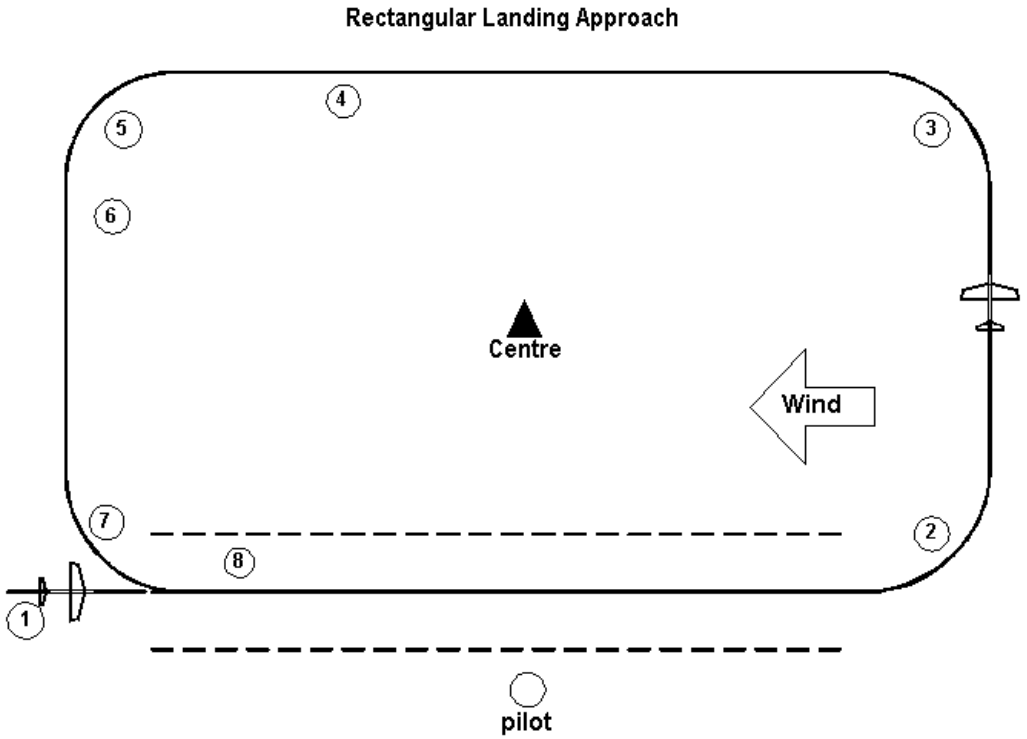
Take Off

- Apply enough throttle to get the model rolling, use rudder to keep it in a straight line.
- As soon as a straight roll is established, advance throttle to maximum.
- As the model builds up speed the rudder takes over, therefore any rudder input to maintain a straight roll at low speed must be released.
- When rotate speed is achieved, apply some up-elevator to rotate, then ease it off after rotation.
- Use alerons to keep the wings level.
- Do not climb too steeply, climb away in line with the runway.
- Reduce speed to cruise speed, then turn to join the circuit.

3. In Flight Trimming

Pilot shows ability to trim the aircraft in flight. Displacement and re-trimming both the primary roll control and elevator should be demonstrated.

4. Rectangular Approach Circuit

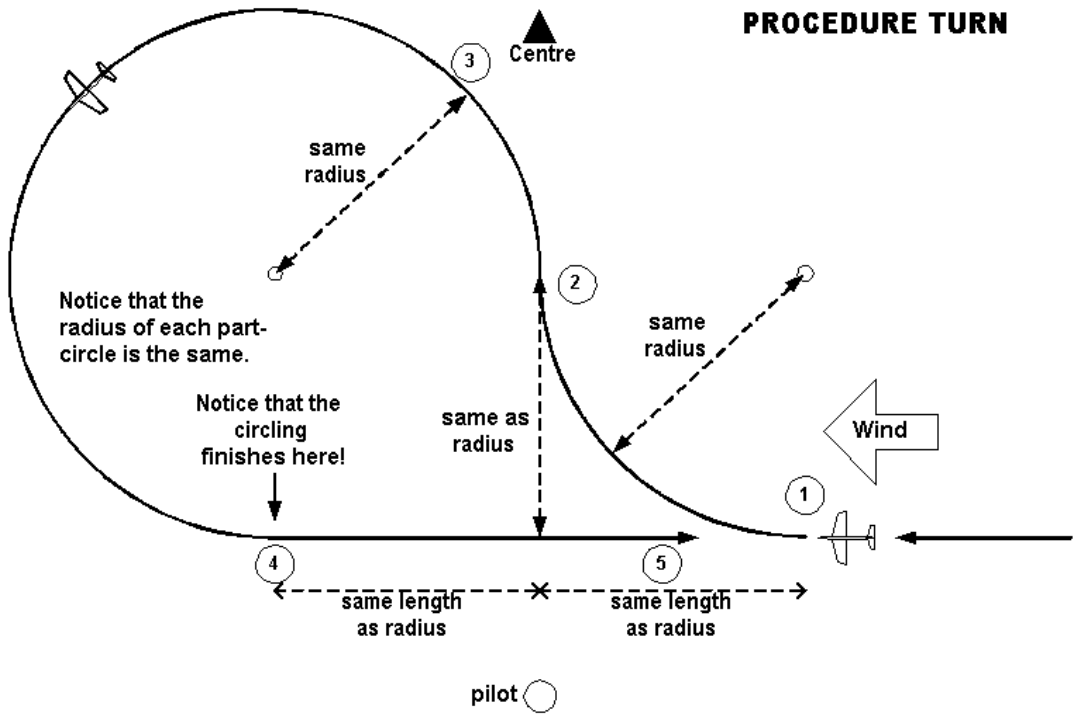


How to…

1. This is a very simple and straightforward manoeuvre, but often performed incorrectly. The manoeuvre is a rectangular *landing* approach, so don't make the mistake of flying it as a rectangular *take-off* approach. The model is flown in for 30 metres from position (1) at an altitude chosen by the pilot. From position (1), the model should not gain altitude during any part of the manoeuvre.
2. The model should be flown for a 30-metre entry line (1) over the far side of the runway, or even a bit further out (don't fly overhead.) at a height that is safe for the model for the whole circuit… without needing to climb. This may be about 40 to 100 metres up, depending on the size of the circuit, and how strong the wind is blowing. Try to position the model so you're looking up at 45 or 50 degrees as it passes in front of you.
3. At (2) (3) (5) and (7) the model makes turns of equal radius. (2) & (3) are to be at equal height.
4. At (4) on the downwind leg, the power is reduced. *Where* exactly depends on the individual model's characteristics (heavy/fast, or light/slow etc.). The turn at (5) can be a slightly descending turn, since it's safer to have the nose down a little when the power is down.
5. The leg at (6) is the descending leg, where height is reduced sufficiently for a final descending turn at (7), leaving enough height for a controlled descending trajectory for landing.
6. NEVER fly in such a place that you couldn't land safely if the motor stops. If you realise your entry line at (1) is lower than you had planned, just make the circuit smaller. In any event, you shouldn't really need to fly more than about 150 metres away from yourself at any point for this manoeuvre, unless you've got a gas turbine missile!

5. Procedure Turn.

From your entry line of flight, start turning at one radius distance before centre and circle 90° outwards, then, 270° the other way, and finish back on the entry line of flight, heading in the opposite direction. Maintain the same height and radii. Note that this manoeuvre can be performed either in front of the pilot or at either end of the runway. The circling should finish at one radius distance from the centreline on the other side to that which you started, and you should be flying your exit line on the same path as your entry line.

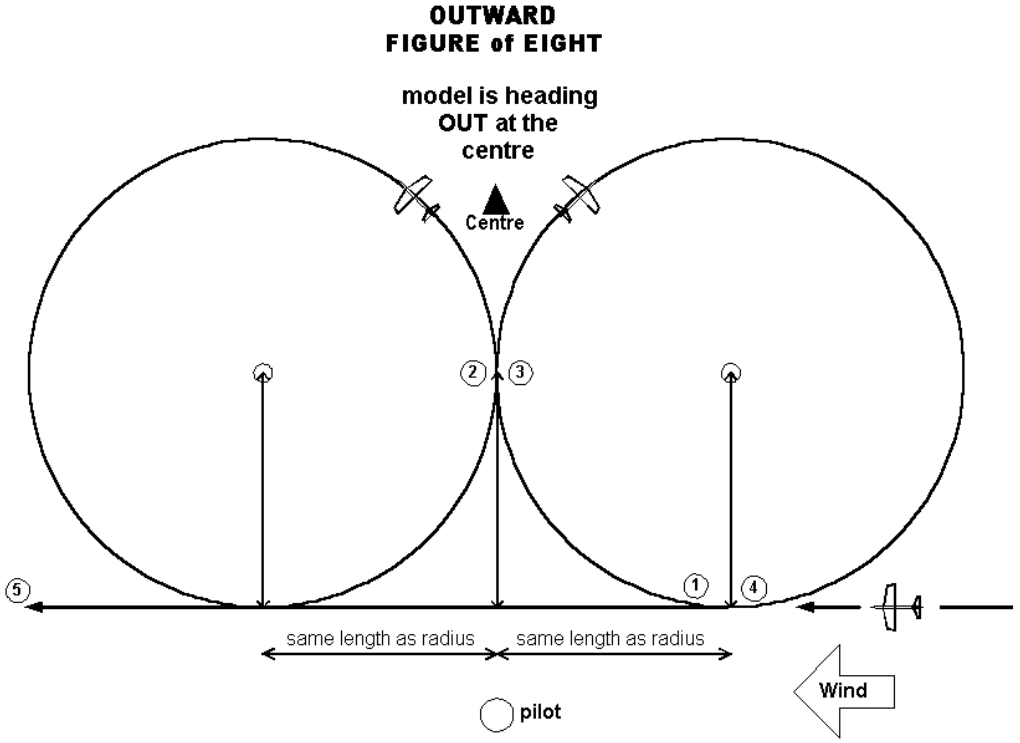


How to…

1. The model is flown on a straight & level entry line of flight, parallel to the runway, only about 30 or 40 metres out from the pilot, and at about 30 to 50 metres up. The model should be at 45 to 50 degrees up in elevation from the pilot. At a chosen distance before reaching the centreline (which sets the radii for the whole manoeuvre) the model begins a turn outwards of constant radius until it has completed a quarter of a circle.
2. The model is turned the other way, and maintains the same radius as the first quarter-circle.
3. The turn is maintained for a total of 270 degrees, or three-quarters of a circle.
4. Note where this circle finishes… exactly as far from the centre-line as the first quarter-circle started.
5. The model is flown out at the same height as the entry line, but in the opposite direction.
6. During the manoeuvre, correct the wings' angle of bank if required, to keep the circles rounded

6. Outward Figure Eight.

Start at a point which is one radius distance before the centreline, and circle 90° outwards to the crossover, then 360° the other way to the centre again, then 270° the other way to finish on the close line of flight again.

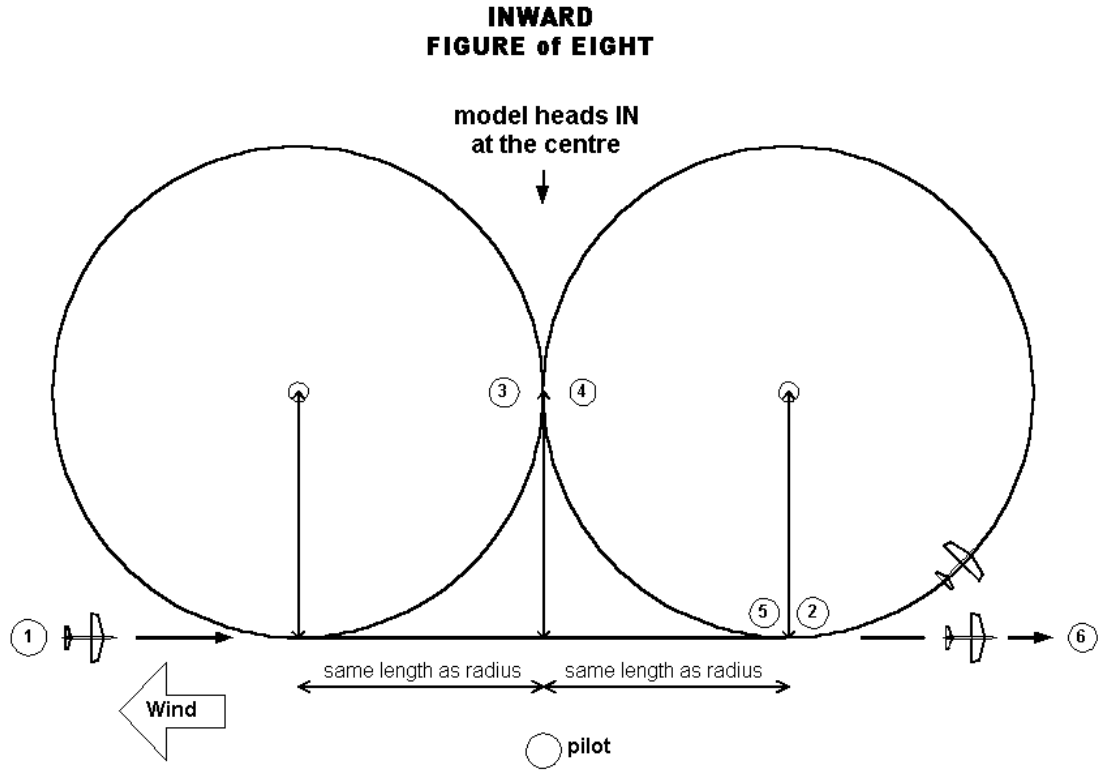


How to…

1. The model is flown downwind on a straight & level entry line of flight only about 30 to 40 metres out from the pilot, and at about 30 to 50 metres up. The model should be at 45 to 50 degrees up in elevation from the pilot. At a chosen distance before reaching the centreline (1), which will set the radii for the whole manoeuvre, the model begins a turn outwards of constant radius until it has completed a quarter of a circle (90 degrees). At this point, the model will be directly in front of the pilot, who will be looking straight down the model's fuselage from the tail.
2. The model is turned the other way, and maintains for a complete circle (360 degrees) the same radius as the first quarter-circle.
3. At the completion of this circle (3) the model is turned the other way, at the same place (2) where it completed the first quarter-circle.
4. The model is flown for three-quarters of a circle, at the same radius, until at position (4) it exits the circle at the same place as the first circle started (1), and is flown on a straight and level exit line to position (5). The manoeuvre is not finished until the model passes position (5) During the manoeuvre, correct the wings' angle of bank if required, to keep the circles rounded

7. Inward Figure Eight

Start one radius past centre, then circle 270° to come towards yourself at the crossover / centreline, then 360° circle the other way back to centre, then 90° the other way back to the close line of flight.



How to…

1. The model is flown upwind on a straight & level entry line of flight, parallel to the runway, only about 30 metres out from the pilot, and at about 30 metres up. After having passed the centreline, when at a chosen distance at (2) (which will set the radii for the entire manoeuvre), the model begins a turn outwards of constant radius until it has completed three-quarters of a circle (270 degrees). At this point (3) the model will be directly in front of (and heading towards) the pilot, who will be looking straight down the model's fuselage from the nose.
2. At position (3) the model is banked the other way and completes a full circle (360 Degrees).
3. At the position (4) the model will again be directly in front of (and heading towards) the pilot, who will be looking straight down the model's fuselage from the nose. The wing is banked the other way and the model is flown for a quarter of a circle (90 degrees).
4. At (5) the model finishes the quarter-circle, and flies a straight and level exit line of 30 metres to (6).
5. During the manoeuvre, correct the wings' angle of bank if required, to keep the circles rounded.

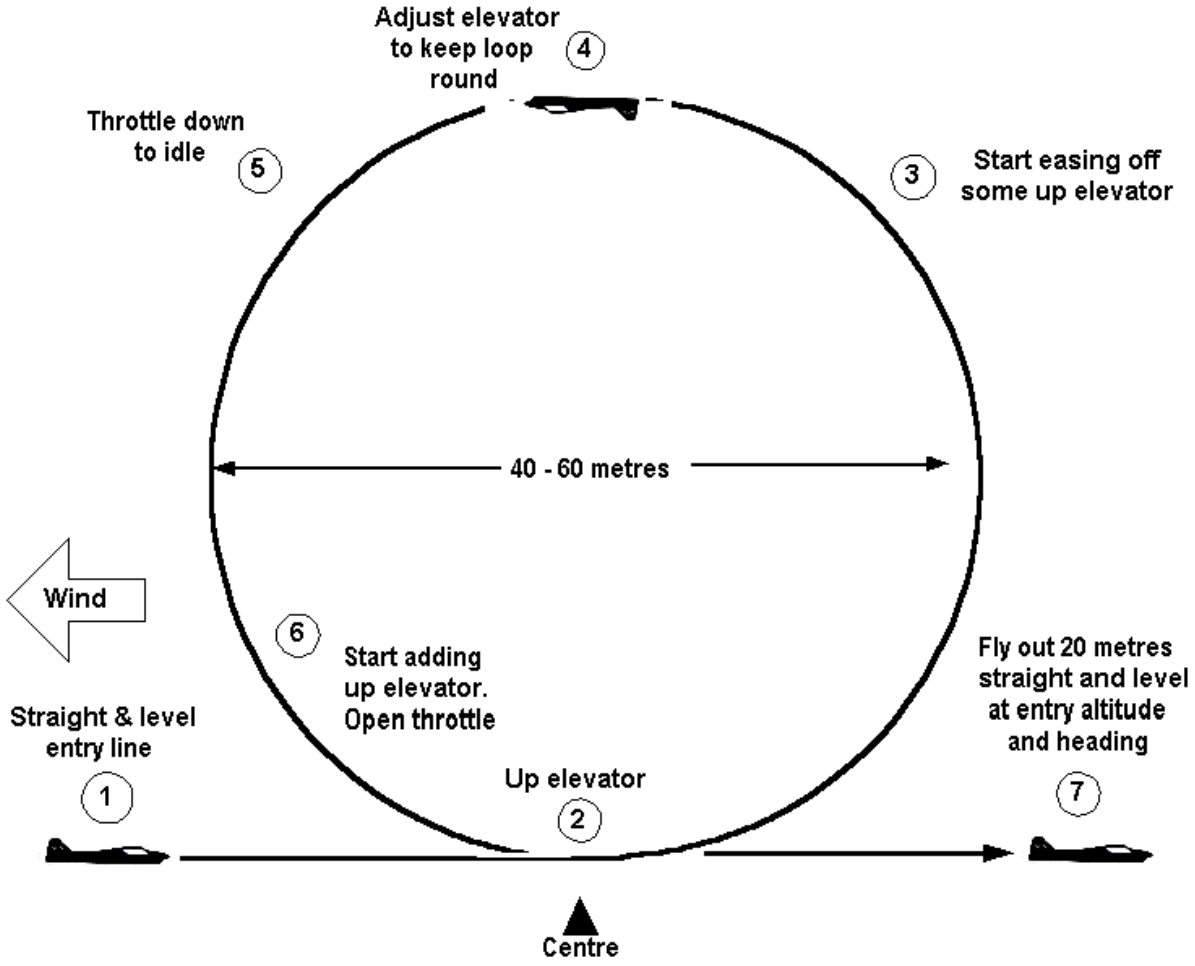
8. Stall and Recover

How to...

- Establish straight and level flight.
- Check the wings are level.
- Reduce throttle to idle.
- Check again the wings are level.
- Add up elevator to 45 degrees.
- As the model reaches stall point release up elevator.
- Models nose will drop, allow model to build up speed, apply up-elevator and recover to level flight, throttle up to cruise speed.

9. Inside Loop

Start at the centre. To overcome the effect of gravity & keep the loop round and the same size, adjust the elevator as required. When you're just past vertical while going up, ease off a bit, and tighten after you're vertical, going down.



How to…

1. Because this manoeuvre is in the vertical plane, it needs to be flown on a line about 100 to 150 metres out to determine that the loops are indeed round. Fly high enough so that there is no danger of getting too low for your model's safety.
2. Enter at full power, straight (parallel to the runway) and level.
3. At the centreline, squeeze in enough elevator to achieve a graceful loop, making adjustments as required to overcome the effect of gravity. The wings should be level at the top of the loop.
4. On the way down, you may need to back off the power a bit.
5. Fly an exit line of at least 30 metres.

10. Simulated Dead Stick Landing

At the instructor's discretion, a dead stick approach will be called at a safe and high position, the student will reduce power to idle and glide the model to a position where a landing can be achieved.

How to...

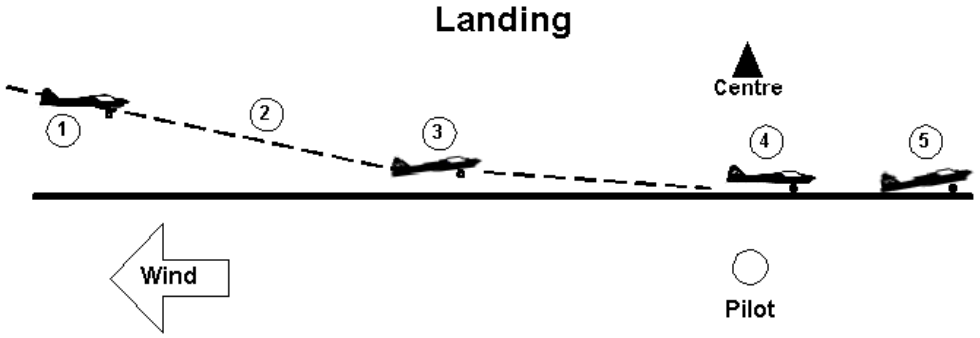
- Nose down attitude is required during the approach to ensure that the model has forward speed to avoid stalling.
- Hold wings level on the final approach.
- When the model is about half a meter above the landing field gently apply elevator to "flare" for a nose high attitude (slowing the model down), hold and "wash off" speed 50mm off the runway until plane settles into a landing.

11. Approach and Landing

Pilot demonstrates an engine assisted landing, using a suitable power setting that allows the model to descend, controlling nose attitude with elevators (airspeed), and using the throttle to stabilise the rate of descent. The aircraft should be flown over the threshold at an altitude of about 1.5 metres, the throttle closed gradually, and the round-out or flare initiated. The "hold-off" period is then commenced where the aircraft is gradually allowed to sink and settle on the ground in a slightly nose high attitude.

Remember the following commonsense safety issues: -

- DO NOT taxi toward, or steer the model so it faces toward anyone.
- DO NOT collapse the antenna or turn off your transmitter while the engine is running.



How to…

1. From the final turn, the model is flown on a descending line that is aimed to contact the runway at a point that is about one-third the way up the runway. The model should be flying quite slowly at this time.
2. Ideally, the model should be kept in a flat attitude (1) horizontal with the runway. If there were no power available, the model would keep slowing down in this attitude, making more and more drag, until it stalled. If just a 'click or three' of power is left on during this approach, the descending path shown (2) should be achieved. However with some 'slippery' models, just two clicks might let the model fly on forever until the fuel is all gone!
3. If it looks like the model is going to land short, add a click or two more power to 'drag' the model a little further along the strip. The model's attitude should not alter at all.
4. If the model looks like it's going to overshoot, then back off the power, and let it slow down some more.
5. When the model is about half a metre above the runway, the 'flare' (3) should be started to slow it down more. This means simply adding and maintaining a touch more elevator to lift the nose a 'degree or three', which will cause more drag. Be careful not to add too much though, or you might force a stall…
6. The model is then 'held off', maintaining the slightly nose-high attitude. This causes drag, and the model keeps slowing down until it loses enough lift that it settles to the runway by itself (4).
7. The power can then be set to idle, and the model is allowed to roll to a stop (5) still parallel with the runway.
8. If you choose to taxi the model back, don't turn the model towards the pits or people. Instead, turn it outwards, away from everyone, and taxi back parallel with the runway. Do not point an unrestrained model at people with the motor running, especially when the model is close. Remember commonsense and safety.
9. Don't stop 'controlling' the model until your assistant/caller has got the model restrained.

12. Taxi Back and Shut Down the Motor

Taxi back along the designated taxi way and shut down the motor at the designated point, all in accordance with Club Rules and Procedures.