Radio Control

FIXED WING

INSTRUCTOR GUIDE

Introduction:

Wing Training Manual and provides background information for instructors.If followed, should produce competent pilots in minimum time, and with minimum effort. While individual instructors may find variations useful, most will find it advantageous to try the methods listed. The order listed is also important as one area of exercise is designed to lead the pupil logically to the next.

The Training Manual is used as a prompt to the instructor and as a record of the pupils progress.

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This guide is written on the basis instruction will be done using a buddy box

1. ATTENTION SPAN AND OVERLOADING

1.1. It is most important to clearly establish the amount of commitment expected from the pupil prior to commencing his initial training. Once this has been agreed the Instructor should then also be committed to continuous and regular teaching sessions. It usually takes the average newcomer between five and six hours actual flying time to reach competent unassisted solo standard. Obviously, this varies with age, regularity of sessions and serviceability of equipment. Every effort should be made to achieve this within a six to twelve weeks period, depending on local factors and personal considerations.

1.1.1. It is necessary that the instructor be familiar with these phenomena, as he must, to be effective as an instructor, continually be aware of and monitor both items.

1.2. Most people have an attention span in an intensive situation such as flight instruction of little more than 10 to 15 minutes at best. Beyond this point nothing more is absorbed, thus continued instruction beyond this point is wasted. The instructor should monitor the attention span of each pupil as each will have a different attention span depending on many variables, including the particular pupil, his disposition on the day, the stage of instruction and not least, the expertise and behaviour of the instructor.

1.3. For instance, an instructor who shouts at pupils should be instantly banished from all instructing as by upsetting the pupil he destroys the concentration and attention span of the pupil, thus making it impossible to carry out meaningful instruction. The pupil needs to be positively coached.

1.4. Similarly, an instructor who talks too much can destroy the pupil's application to learning. He should be told what he is to do, shown what to do, if necessary, and left to do it. When he makes

the same mistakes several times, then point out to him, as concisely as possible how to correct the situation.

1.5. Which leads us to overloading. This is a situation where the pupil is fed more information than he can handle at once, or where he is called upon to carry out more actions or make more decisions in a given time than he is capable of at the particular stage of his flying experience. A typical example is the common practice of expecting a new pupil to handle both elevator and rudder (or aileron) simultaneously, rather than teaching one, then the other, then combining the two. Additionally, if a model is flying too fast for the pupil this will lead to a shorter attention span and subsequent overloading.

1.6. Always remember - that a pupil who is overloaded will be confused and will lose attention and concentration. One who has passed out of his attention span will overload very easily. Thus the two are interlinked and equally crucial to effective, safe, instructing.

1.7. An example would be the pupil who, having flown for 10 minutes, is called on to essay his first landing. The result can well be disaster, caused by a pupil who is near to the end of his attention scan becoming overloaded by suddenly having the trauma of a first landing thrust upon him.

2. BEHAVIOUR OF THE INSTRUCTOR

2.1. The case of the shouting instructor has already seen mentioned. The behaviour of the instructor is crucial to the whole process of learning. He must present the whole thing in a palatable attractive form.

2.2. It must be remembered that the flying pupil, full size or RC, is going to be in most cases. quite terrified of the whole thing. He is terrified that he will bend his new aeroplane, and terrified of making a fool of himself. There is also a good deal of apprehension to being taught by someone who obviously knows it all; someone to whom flying is easy.

2.3. Therefore, a gentle, smooth, considerate approach, recognising the terror of the pupil, is essential. The necessary information must be supplied by the instructor, clearly and precisely, without unnecessary verbosity, and the pupil allowed to get on with it.

2.4. A good instructor will rarely, if ever, have to take ***over control*** from the Pupil in other than a controlled and anticipated way. In other words, he will not usually allow an emergency type of situation to develop. He will achieve this by close control of height and position, and by careful instruction so that the pupil we be properly prepared for what he is called upon to do. In the event that it becomes necessary for the instructor to take ***control*** it should be done with as little drama as possible and should never be the start of a shouting match. The aeroplane should be righted, set in a safe position, and the transmitter returned to the pupil as soon as possible.

2.5. A good instructor will spend very little time flying the model himself. But rather demonstrates the task/s he wishes the pupil to undertake , ascertains the pupil's understanding and as appropriate provide control of the model to the pupil if he/ she is confident to attempt the tasks.

2.6. Most instruction will be carried out in a club type of situation where there will be other people flying, standing about, etc. It will sometimes be necessary for the instructor to protect the pupil from the eager beaver type who will try to talk to the pupil while flying, often doing untold harm.

2.7. With all the best intentions in the world, an Instructor must not neglect his own flying skills and should take steps to make sure that he retains his own expertise by setting aside flying time for himself without the burden of anxious pupils awaiting further instruction. Additonally, a good Instructor must at all times fly within his own limitations because overloading and attention span can and does affect everyone to some degree. Prior to taking on a new pupil, it is most important to clearly ascertain his/her previous aviation/aeromodelling experience. This will give you a solid basis from which to commence an efficient teaching programme. From this you can decide just how much, if any, 'JARGON' you can use and, how much you actually need to teach. Initially keep normal jargon to a minimum, or at least, explain it as you use it; after a short period of time it will become self explanatory.

3. THE CURRICULUM

3.1. INTRODUCTION

3.1.1. From the outset it should be understood that the ultimate aim of any instructor training people to operate R/C aircraft is to turn out pupils who are capable of flying safely, and who can fit into a busy club or contest scene with a minimum of discomfort to themselves and existing club members ***and finish training ready to pass the Wings badge test . A copy of the training manual should be provided to the pupil as a reference and record of training. The MFNZ Fixed Wing Training Manual provides a structured programme with this aim.***

3.1.2. In the past, there has been a tendency to accept a pupil as trained when he reaches a level of keeping the aircraft airborne and being able to land the model more or less upright

3.1.3. To often, these flyers, when faced with the additional workload found on busy flying fields, go into overload and the result is what appears to be unsafe or dangerous flying when in fact they simply cannot cope with the restrictions (e.g. right hand circuits, sun or pits in the wrong place etc.), noise and presence of other aircraft, and so on, because during their training they developed bad habits, such as only doing left hand circuits, flying on quiet days, and generally avoiding unpleasant situations.

3.1.4. Obviously then, it is up to the training system to prepare pupils adequately for real life situations, and this must be done from the beginning, before the bad or restrictive habits start to form.

3.1.5. Consequently, it is important to vary the pupils training so that all manoeuvres are attempted in the reverse directions, e.g. left and right hand circuits, loops and rolls from left to right and right to left. This is absolutely vital during training, for any R/C pilot who has learned only one landing approach (left hand circuits for example) can relate just how difficult it is to attempt right hand circuits in emergency situations.

3.1.6. Keeping in mind then, that care must be exercised to avoid pupil overload, the required discipline must be introduced from the beginning and in readily absorbed portions.

3.1.7. Thus it should be pointed out to the pupil from the outset, that as he eventually has to guide the aircraft into a very narrow corridor in order to land on the flying field, he will be required to work in defined areas of the sky at all times during his training, in order that he learn the control skills required, to guide the aircraft, into the landing corridor. This becomes particularly important when one realises that the average pupil allows the aircraft to tow him around the sky, instead of guiding the aircraft in the correct general direction. Thus pupils end up with aircraft too far down wind, over pits and generally unsafe locations.

3.1.8. It is reasonable to consider the entire training sequence as a preparation for landing. When taking into consideration, just how difficult it is to arrive over the landing spot, at the correct altitude, attitude and speed, it becomes obvious that the landing approach must be automatic in response if pupil overload is to be avoided at touchdown.

3.1.9. Thus during the entire training period increasing emphasis should be placed on the pupils ability to guide the aircraft into an increasingly narrow corridor thereby enhancing his skill at arriving over the landing circle with a minimum of strain.

3.1.10. The approach to adopt in teaching an awareness of location is to define the flight area as illustrated in fig. 1. It must be understood by the pupil that each flypass regardless of height or direction should be made parallel with the strip, unless otherwise called for. The effect of cross winds and the the method of correction for any crosswind should be discussed with and if possible demonstrated to the pupil

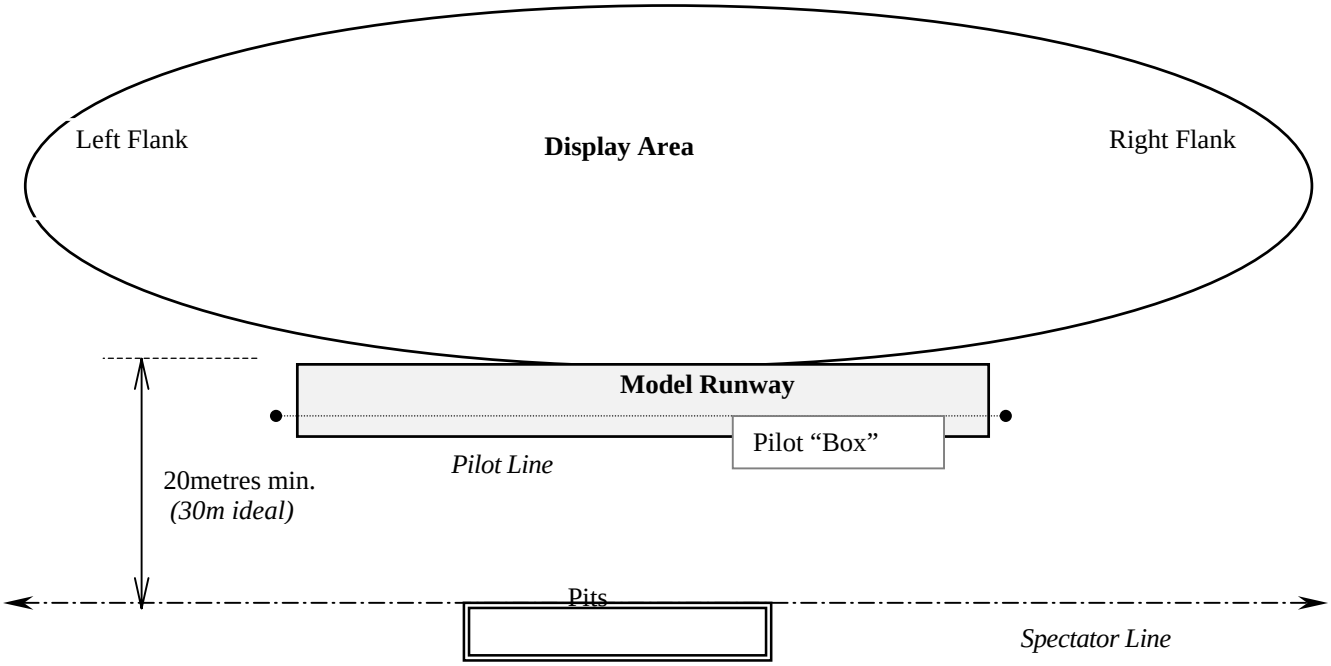


Fig. 1

Note: Each individual club flying site will naturally have its own unique restrictions and limitations, because of the local layout. Consequently the left and right flanks and display area might have to be modified individually to accommodate these restrictions and local limitations.

3.1.11. Thus we now have a typical situation in which we have the Display Flying Area, Left and Right Flank, and the Forbidden or Pit Areas. Training can now proceed with even simple exercises to be carried out in one of the three acceptable areas. The instructor can now very easily ascertain the pupil's ability to hold the aircraft in the designated area and the pupil knows exactly what is required of him in advance of the training session. As the pupil becomes increasingly aware of his location and surroundings, this corridor should be narrowed down until at the final stages of the procedure turn training, the corridor should be precisely followed as this manoeuvre is the prelude to the landing approach, in that is contains all of the elements required in a correct approach. i.e. long straight flight, coming toward the pupil with controls reversed.

3.1.12. Time effort and care spent in the previous areas will pay handsome dividends when the first landings are attempted, as a well prepared pupil will find what is quite rightly accepted as the most grueling area of R/C flight training, reasonably simple, with the consequent reduction in repair times and a corresponding increase in confidence and enjoyment.

3.2. AIRFRAME CHECK-OUT

3.2.1. Sufficient time must be given to this item to ensure that the model is properly airworthy. Check engine mounting, plumbing, centre of gravity location, control linkage security , pinned control surfaces , control surface directions, throttle setting, undercarriage secure, any signs of structural or covering problems which could affect flight, e.g. control neutrals and throws, presence of warps which could affect trim, battery status and range checks. Demonstrate the procedure for aerial down range check and explain the signs of a possible range problem such as control surface jitter. In the case of electric models range checks should be undertaken with motor running

3.2.2. Do not take risks! Ensure that the aircraft is safe before flight. It may be practicable to lay off the job to a reliable and experienced club member, but do a final check yourself, particularly of control throws, sense and neutrals, as these, and a knowledge of any warps present will give some idea of what to expect in the air.

3.2.3 The precautions and procedure associated with starting engines should be discussed with the pupil and demonstrated. Such aspects to cover are:

- Model restraint
- Propeller arc and risk of injury
- Glow driver application
- Chicken stick use and or electric starter
- Priming of engine
- Tuning of model and " nose up at full throttle" tuning
- In the case of electric models the precautions in relation the battery disconnection.

3.3. TEST FLIGHT

3 3.1. Fly safely! The worst sin an instructor can commit is to damage a pupil's aeroplane (excluding system failure). Check flight characteristics at high and low speed, stall and spin characteristics, trim accurately and check engine idle setting. Set control throws, not for your enjoyment but for the beginner. Enough elevator to flare on landing, enough rudder or aileron, whichever is the primary directional control, to control the aircraft at low speed on approach, which means usually not enough rudder to roll the model, or in the case of ailerons, 3 rolls in 7 or 8 seconds. Remember, a beginner does not want a "touchy" aeroplane, but rather one which has smooth and progressive responses which allow him to feel how much control input he is applying. You are not setting the aeroplane up for you to go hot-dogging, you are setting it for a beginner. In general, most people use too much control sensitivity.

If utilising a buddy box system have another experienced flyer test and set the trim of the buddy box.

In modern computer radio sets the use of dual rates and exponential settings can aid in a model with "pupil friendly" responses

3 .4. FIRST FLIGHT

3.4.0. Note: Dexterity training has in the past been overlooked and this has become obvious by the lack of awareness of the difficulties pupils face in merely handling the transmitter controls. Consequently some basic form of finger exercises should be given in order that controls be located automatically and without distraction. Too often the pupil is preoccupied in locating the required control instead of flying the aircraft. This is particularly important in co-coordination the double axis controls. The pupil should be asked to practise finger dexterity at home, rather than taking up valuable time at the field, initially with the model pointing away from the operator, then towards himself until fully familiar with the operation. Then also practice with the model pointing at various angles to and from the operator. Practice should take place using the main sticks and also the trims until fully conversant with all inputs operated in the correct sense. A useful exercise to aid this practice is to place the TX under the table so that inputs are being made without being able to see the TX Box. (In any real emergency situation, corrective action must be applied without looking at the TX.).

3.4.1 Before each flight the instructor should explain the aims of the flight and what is to be attempted.

3.4.2 The pupil should be instructed in the use of the controls before the flight commences. The aircraft should then be flown to altitude high enough for safety, but not too high for the untrained eyes to see it clearly. The throttle should be retarded to about half power (correct setting depending on the particular aircraft) and the elevator trim set to maintain level flight

Note: From this point on altitude control should be maintained by small, subtle, throttle adjustments. The aircraft should be positioned facing into wind, just upwind and out from the pupil.

3.4.2.A At this point it should be demonstrated that the aircraft will glide should the motor cut This will reduce the pupil's fear of the model crashing due to loss of power.

3.4.3. The pupil should now be asked to place the right thumb on top of the rudder or aileron stick whichever is the primary roll control (which will henceforth be referred to as aileron in the hope it will be such).

Note. Where a three channel installation is used (throttle, rudder and elevator), the rudder should be arranged to be controlled by the aileron stick, i.e. right hand stick when using mode 1, as it will be the primary roll control.

3.4.4. The pupil should now be given control of the model and asked to bank the aircraft gently to the left by easing the stick to the left, then to bring the wing level again. Then to the right. He should be asked to bank the aircraft, to reduce bank, increase bank, hold bank angle constant, and to hold wings perfectly level during straight flight.

Note: It is important to stress that after having applied the initial control input, the main control must be allowed to re-center as the aircraft will continue to, e.g. roll, so long as that control is deflected. In preparation for a turn the procedure is as follows: With the aircraft flying straight, aileron on, aileron off, elevator on and hold. Opposite aileron to correct for straight flight when the turn is completed.

3.4.5. During this time the instructor must hold the aircraft perfectly level at all times with the elevator and make any altitude corrections by asking the pupil to "push the throttle forward 2 notches", or, pull the throttle back 3 notches", whatever is needed. These commands should be called for at quiet times when no other command is needed in order to avoid overloading. In this way use of throttle is taught without it intruding on the primary controls.

3.4.6. The correct position for a pilot to stand on the flight line, whether a pupil or not, is at right angles to the runway direction. He should not stand either facing towards the model or facing away from the model. Bearing in mind that a model should normally be flown in front of the pilot, not overhead or around him.

3.4.7. As soon as some competence becomes evident, the instructor should move to the right of the pupil, take over the aileron stick, and ask the pupil to place his thumb on top of the elevator stick. It is important that the aircraft be suitably positioned so that as the exercise is commenced there will be as long a period of time as possible before a turn is needed.

3.4.8. The instructor should demonstrate stall and correction thereof. The pupil should now be called on to "pull the nose or the aircraft up a little with the stick" Allow the aircraft to approach the stall, but as stall point is reached cease the reduction in speed by calling for the nose to be pushed down a little, and again point out the increase in speed. Now ask the pupil to level the model out after stall correction and hold the nose level as he makes a turn. Show him that the nose will always drop in a turn and have him hold it level using elevator as he/she makes a series of turns, gentle at first, then steeper, then varying. Again, as soon as competence is shown move on to the next part of the lesson.

Note: The order laid out here for the first flight is very important .. As mentioned earlier the pupil will at this stage be very nervous. Thus it will be better to teach bank control first as this hasn't the overtones of disaster carried by elevator. Similarly 'up' is taught before 'down' so that the pupil will have the feel of the elevator before he tries 'down ' and will make a better job of it .Demonstration of propping up the low wing with the aileron stick when the model is flying towards him / her should be demonstrated and practiced by the pupil.

3.4.9. While it is necessary to ensure that the pupil has a proper grounding on each control it is also well not to dwell longer than necessary on each section. Keep it interesting and the pupil will remain receptive to teaching.

3.4.10. The pupil should now be called upon to make a "90 degree turn left", "270 degree turn right" etc. He/ she should be made to fly straight and level between turns, as this is one of the hardest things to do.

3.4.11. During this period, and all subsequent ones, it should be emphasised that the aircraft is never to be flown overhead but always out in front of the pilot, as flying overhead is dangerous due to the inability to accurately judge the pitch angle.

3.5 CIRCUITS

3.5.1. The pupil should now be told the reason for the circuit i.e. the establishment of height, distance judgment explained to him. The pupil should become confident in constant height and level flight before proceeding with the next stages of training. The ability to do this cannot be overstressed.

3.6. SUBSEQUENT FLIGHTS

3.6.1. As soon as turns are reasonable, the pupil should be introduced to flying figure eight patterns of varying sizes. This is used as an exercise in coordination between elevator and aileron.11

3.6.2. Begin with the outward figure 8 (fig. 3), and progress to the inward figure 8 (fig. 2).

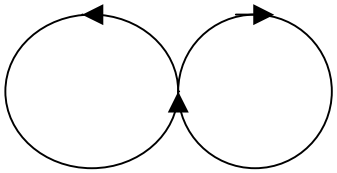


Fig 2: Inward

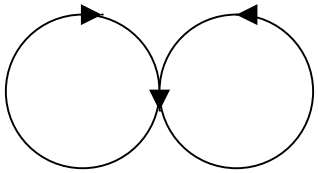


Fig 3: Outward

3.6.3. The outward manoeuvre is much more difficult than the outward figure 8 as the final turn is made whilst the aircraft is crossing in front of the pupil hence he must cope with apparent control reversal as well.

3.6.4. At about this point in the training program, increasing emphasis should be placed on positional accuracy. Figure 8's being ideal for this as a definite cross-over point can be defined, and the pupil made aware of his ability to achieve cross-over accuracy and even circle size.

3.6.5. Even free flying should be carried out in a designated quadrant if this can be achieved without pupil overloading.

3.6.6. As competence is established, the time has come to relax the full guidance used to date, and also to instill more confidence. To this end the pupil should be told that the instructor wishes him to practice turns and straight flight without the instructor's help. Stay close to the pupil, let him sort himself out if possible.

3.7 PREPARATORY EXERCISE FOR TAKEOFF AND LANDING

3.7.1. With both competence and confidence becoming established, it is now time to begin an exercise at preparing the pupil for take-off and landing. Have him fly the aircraft in toward himself from some distance out, passing by at normal cruise altitude, and flying on out away from himself. As soon as this can be done well, keeping a straight path with wings level, the takeoff can be taught.

> *Note: Because of the extreme effect of aircraft trim on flight performance, particularly take-off and landings, some introductory instruction into the fundamentals of trimming should be given by demonstration of the degree to which all flying exercises may be simplified with the correct application of trim, Conversely, flying an out of trim aircraft can become almost impossible for the pupil and this should be demonstrated by the instructor in order that the lesson be driven home. Trimming exercises to be carried out by the pupil will be introduced at a later date. (See 3.9.)*

3.8 TAKEOFF

3.8.1. With most modern models, take-off should be easily accomplished. Emphasis should be laid on gradual application of power while keeping the model straight, and using a little elevator to lift off, and make a gentle climb out with wings level until safe altitude is reached. Verbal instruction should be all that is necessary as the pupil has been well prepared and has watched the instructor take off on a number of occasions.

3 8.2. The possibility of an engine failure on take-off should always be taken into consideration. Up unto a certain critical point (depending on the individual design of the aircraft) during the take-off sequence, very little if anything can be done to cope effectively with the situation. However, there are a number of logical steps that can be followed that should eliminate the remote possibility of a dead stick during takeoff procedure:

a) Do not attempt to carry out a take off if not completely satisfied with engine performance.

b) Always make full use of the available amount of runway. (Remember the runway behind you is of no use to you during an emergency.)

c) During the takeoff run, allow the wing to do the work, don't climb out too steeply, give the motor a chance without overloading it.

d) If the engine should give any signs or trouble during the take-off once committed in the air, quickly reduce the throttle, say back to half power, and then carefully nurse the aircraft around the circuit, land it and re-adjust the motor.

e) If the engine does fail when still low and slow, don't try to turn back onto the runway, keep the wings level and land long - say down the runway or into the overshoot area (A turn should not be initiated after take off [except in some emergency, i.e. perhaps personal injury to someone] until the aircraft has reached a height from which it could be reasonably expected to be able to carry out a safe emergency landing if required.)

3.8.3. The pilot's position after the first few takeoffs should always be on the flight line including during the take-off sequence. However, during the initial take-off learning process, after carefully liaising with other modelers, the take-off should be practiced with the pupil standing behind the

aircraft. Once this has been achieved safely and consistently, the pupil should be gradually required to move further away, in stages from behind the aircraft after each take-off until finally he is carrying out all take-offs from the correct position on the flight line

Note: Don't proceed out onto the runway until engine checks have been carried out.

3.9 PROCEDURE TURNS

3.9.1. This sequence is included as it introduces overhead flying, sequential controlled turns, (in both position and altitude) and reinforces the pupil's ability to fly a straight line, both away from, and toward himself. As such it really is the most important manoeuvre when wishing to prepare a pupil for an accurate landing approach.

3.9.2. The pupil's ability to perform the following steps in the Procedure turn should be monitored and relayed to him in easy stages:

a) Level flight segment should be straight and level.

b) Aircraft should pass directly over landing area.

c) Turns should be at a constant altitude.

d) Turns should be completed in order that upwind and downwind tracks are superimposed.

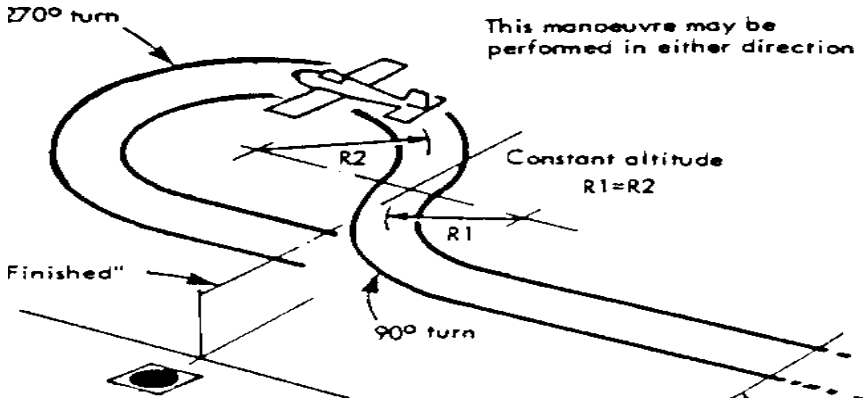


Fig 4

3.9.3. It is fairly obvious that this manoeuvre will require considerable practice, however once mastered the pupil will be able to exert considerable control ever his model in all phases of R/C flying.

3.9.4. By the time this manoeuvre is mastered, the pupil will be ready to begin landing approaches with a great deal of confidence in his ability to position his aircraft accurately.

Note: This manoeuvre is excellent to establish positional accuracy over the runway, however, it does have one limitation. During busy club flying activities, say when left hand circuits are the norm by other pilots, the right to left portion of this procedure is in conflict to the normal traffic pattern, and can result in possible head-on conflictions. This situation is reversed when carrying right hand circuits.

3.9.5 While the various exercises have been listed in a logical order which should basically be followed, in fact there is often an overlapping between the various exercises. This is because it is not wise to spend a whole flight, or a whole afternoon, hammering away at one particular aspect. Both pupil and instructor tend to become heartily sick of the whole bit if this is attempted.

3.10 SIMPLE AEROBATICS TRAINING & TRIMMING

3.10.1. Orientation training should be inserted into the training program at the instructors discretion and is best described as being that part of training aimed at teaching or preparing the pupil to recover from difficult or out of control situations. This is best used as part of the monotony relief aspect of flight training and should include recovery from inverted flight, spins, loops, roils etc.

3.10.2. However, this phase of training should also include trimming of an "out of trim aircraft". The devastating effect of a badly trimmed model on a novice flier, must not be overlooked, as many crashes are caused by this problem.

3.10.3. At first the model should be taken to a reasonable altitude. The pupil should be asked to displace initially the primary roll trim. He then notes the effect on the aircraft i.e. rolling with hands off. He should now be taught to re-trim by setting the aircraft level with the main stick, applying some trim, resetting level again with stick and noting the result, repeating this procedure as necessary to achieve final trim. This procedure must be followed in order to prevent over-trimming in the opposite direction. The Instructor must remain extremely alert to the fact that the pupil may not be able to rectify this situation, and it is important that only one trim at a time initially be tampered with. Commensurate with the pupils progress, the instructor should follow up in stages, with single out of trim, then more than one out of trim situation, without the pupil's prior knowledge. The latter should be carried out during subsequent normal flight training, bearing in mind that even the more experienced fliers have difficulty in correct recovery, hence diligence on the instructor's part is essential.

3.11 CIRCUITS

3.11.1. The pupil should now be told the reason for the circuit i.e. the establishment of height, distance judgment explained to him. Varying wind and sun position should be used to build the ability to land from a right or left circuit. The ability to do this cannot be overstressed.

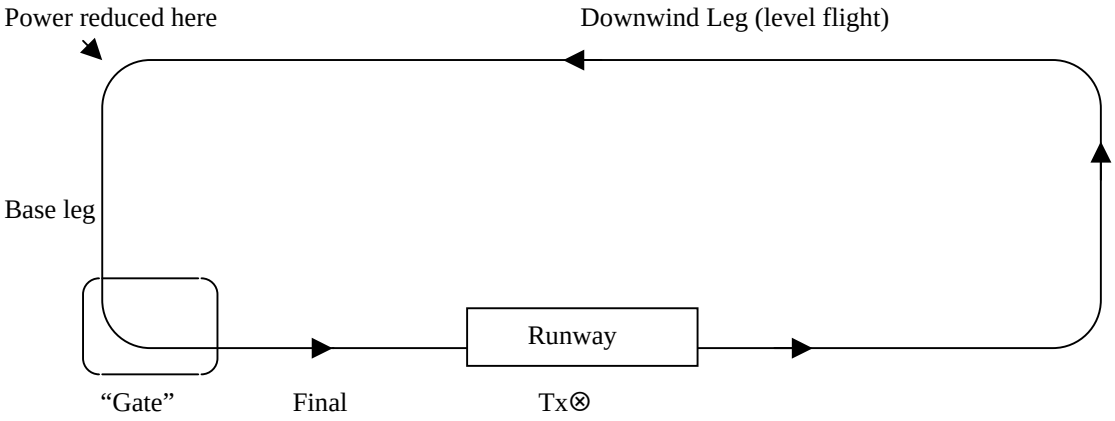


Fig 5

3.11.2. It is important to point out to the pupil that a correctly positioned circuit at the correct height leads to a good approach which in turn positions the aircraft for a good landing. To reduce the standard of the circuit and/or approach makes it all the more difficult for the landing. After demonstration, have the pupil fly the circuit pattern at the appropriate height and distance but initially maintaining height on base and final.

3.12. APPROACH

3.12.1. We now come to an important phase of our training - approach and landings. Despite their relevance and importance, there exists a lot of misunderstanding on the subject and before the instructor teaches this phase, it is paramount that he himself understands the 'why' philosophy in this area. Even more experienced fliers are to some degree unsure of executing a properly controlled approach and landing, basically because it has become oversimplified. *N.B. There are no short cuts!*

3.12.2. What follows is not intended to be exhaustive, nor is it an indication of the standard that a pupil must immediately reach, but rather to fully explain, and as a result initiate correct techniques that with practice, will reward all concerned.

3.12.3. It is important to point out to the pupil that a landing can only be expected to be made off a reasonably controlled approach, and that landings will not be attempted until the pupil can fly the aircraft reasonably well 'down the slot'. *N.B. It is futile attempting landings before the approach is taught, as bad landings always result from poorly controlled approaches, and much harm can be done to a pupil's confidence and progress by pushing him into an unknown area too quickly.*

3.12.4. The approach should be taught initially as an extension of the circuit and completed on final by 'going round' on the instructor's command. This is allowed to progress further and lower as the pupil gains experience and ability in flying the aircraft down the slot.

3.12.5. In order to be able to fly accurately down the final flight path or 'slot', the aircraft should pass through the 'gate' (see Fig.5) this gives the correct positional line-up down the centre line of the runway and, must therefore be continually monitored and maintained to achieve an accurate landing.

3.12.6. A landing is the result of an ACCURATELY FLOWN APPROACH, but before the correct techniques are explained, it is important to examine a common error. To do this, let us execute a glide approach to make a good landing on the field but whilst flying a square base. It is difficult to know under varying weather conditions, where to reduce power in order to arrive at the field in the correct landing configuration, and we must therefore assume that in most cases we end up either HIGH or LOW somewhere on final approach.

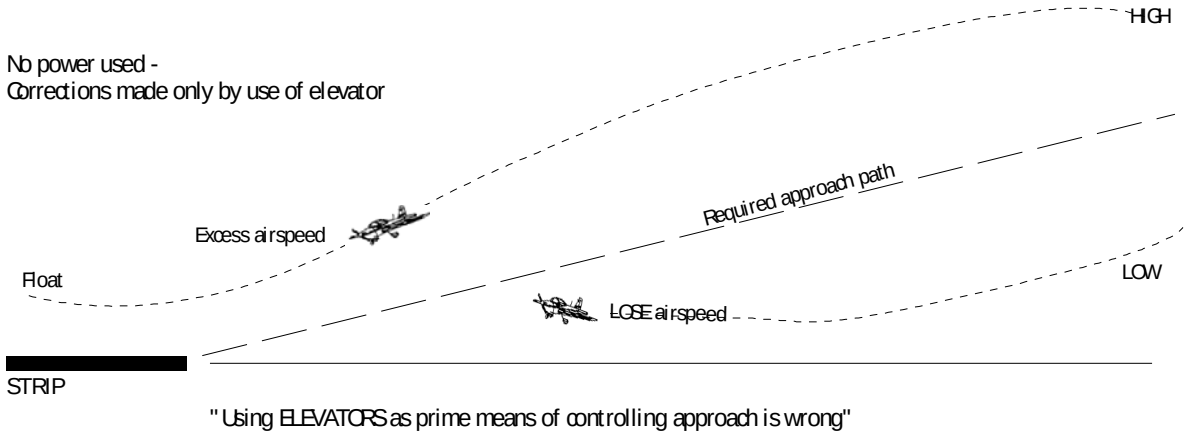


Fig 6

3.12.7. If approach is low, and we stretch the descent, we LOSE AIRSPEED, and consequently land SHORT and/or close to a STALLED condition. In the worst case, a flick roil will result.

3. 12.8. If approach is HIGH, and we dive slightly to prevent over-shooting, then we end up prior to landing with EXCESS AIRSPEED and consequently land FAST and LONG or FLOAT.

3.12.9. If we were now to make the approach power assisted, with flight path corrections being made by elevator as described, speed control remains erratic and power requirements also become confused. The fallacy that elevator is the primary control during final approach must be impressed upon the pupil.

3.13 THE CORRECT TECHNIQUE FOR A NORMAL LANDING APPROACH IS:

3.12.1. Engine Assisted with approximately 1/4 power. It will be seen later that this is to correct BOTH high and low approach situations.

3.13.2. Attitude is controlled by ELEVATORS. Bear in mind that the modeler does not have direct airspeed indication and the only parameters available to him are his attitude along the flight path. The correct attitude throughout the approach is NOSE LEVEL (no flaps). Strictly speaking full size aircraft attitudes are constantly changing slightly in order to fly at the correct air speed irrespective of

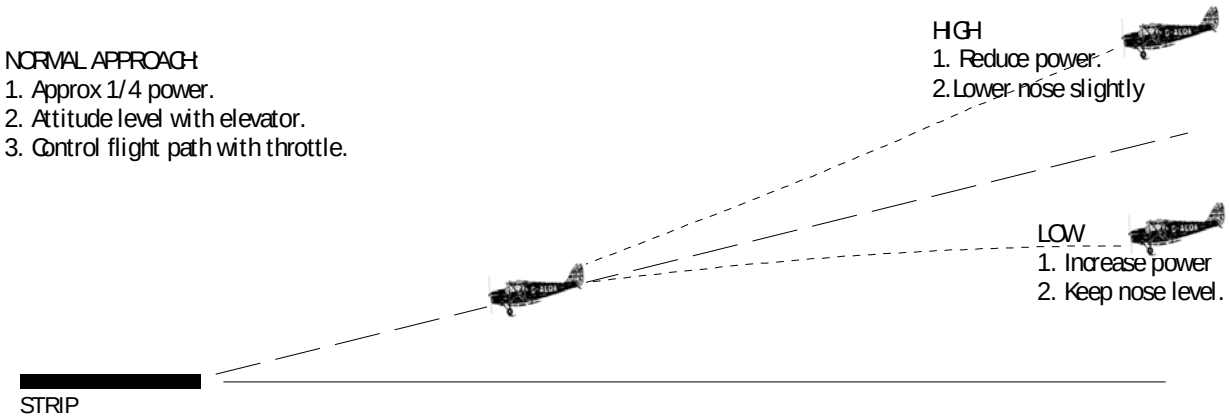
power output, but bear in mind the accurate information available to him in the way of e.g., airspeed indicators, rate of descent/climb indicators etc. The only major change in attitude is during the lowering of flaps where the nose attitude is LOWERED considerably. The only other variation to attitude throughout the approach is where a reducing airspeed approach is employed. Here, the nose attitude is gradually raised as speed drops off.

3.13.3. However, if we were to stand back for some distance and watch the full size aircraft fly a STABILIZED approach at the normal three degree approach angle, it would be difficult to notice any ATTITUDE CHANGES whatsoever. Reynolds number and other scale effects result in the model stalling and maneuvering at far smaller angles to the airflow (angle of attack) than full size aircraft. It follows that any attitude changes on a model to produce a given result are generally less than the full size aircraft.

3.13.4. Due to the factors mentioned above, the 'model's' approach angle, and our airspeed requirements, the NOSE ATTITUDE for a no flapped approach is LEVEL. Impress on the pupil that he must do this continually with elevators. Provided our aircraft is established on the correct approach path and angle, the airspeed prior to landing will automatically be controlled within the required parameters.

3.13.5. Fight Path Angle (angle of descent) is controlled by THROTTLE. Primarily power is used to 'place' the aircraft on the correct approach path and not elevators. Power controls the rate of descent and hence the resultant flight path, and is normally reduced for approach at the commencement of base leg.

3.13.6. Any displacement from the correct approach path should be corrected so as to re-intercept the required approach path as early and smoothly as possible, and not to continue high or low all the way in. This returns you to a situation where you regain maximum control over the aircraft, and one that



you are most familiar with.

Fig 7

3.13.7. If approach is low:-increase power. This reduces the rate of descent and flattens the approach angle. Remember though, to keep the nose attitude level. With this attitude, too much power will stop the descent completely as models fly level quiet easily on ½ power so ease that throttle. Once

the required approach is intercepted, reduce power back sufficiently to follow the correct path, but keeping nose attitude level.

3.13.8. If approach is high:-Reduce Power. This increases the rate of descent and therefore steepens the approach angle. N.B. Prolonged use of very low power settings will require a slight lowering of the nose attitude to prevent loss of airspeed. Once the required approach is intercepted, reintroduce power sufficiently to follow the approach path and remember to return the nose attitude to level.

Note: The Approach Summarised: This must be understood and cannot be overemphasized to the pupil :

a) Engine Assisted 1/4 power.

b) Control Nose Attitude and therefore Airspeed, with Elevators.

c) Use Throttle to place the aircraft where you want it to be.

3.14 LANDING

3.14.1. Most pupils are apprehensive about their first landings. This can be overcome in a rather sneaky fashion. After the pupil has practiced a couple of reasonable approaches, pick one that is most likely to produce a reasonable landing. Allow him to continue the approach over the threshold. Meanwhile the pupil is waiting for the instructors command to go round - but instead, a call of keep her steady, close the throttle, begin feeding in some up, a little more up, up . . . and, the aircraft lands. After the stunned silence, congratulate him on his first landing. This way the pupil does not have any traumas in anticipation of a landing coming up, and he will be most relieved that his hidden fear of landings was totally unjustified. Now we simply polish the technique, and more importantly, he pupil is much more relaxed than he would have been otherwise.

3.14.2. It is prudent now to discuss the correct landing technique. If the correct approach has been flown, then our speed should be sufficiently accurate, i.e., nose attitude level, on a descending flight path and approximately 1/4 power. Only experience with a particular model will dictate minor variations where applicable.

3.14.3. The aircraft should be flown over the threshold at an altitude of approximately five feet, this will allow a landing at about fifty feet inside the threshold. Remember this is the final aim, and the instructor's discretion is used here to help the pupil correct any out of tolerance situations. At this time the throttle should be closed completely and as the aircraft settles towards the runway, the round-out or flare is initiated. Discretion is used at earlier power reductions. At completion of the flare, the 'hold off' period is commenced where the aircraft is slowed down further, held off the ground but gradually allowed to sink and settle on the ground in a slightly nose high attitude. The aircraft has now landed at an airspeed just above the stall.

Note. It is important that the instructor remind the pupil of the requirement that wherever an approach or landing becomes difficult to control and/or out of reasonable tolerance, to 'go round' rather than persisting with complex situations he may not be able to control.

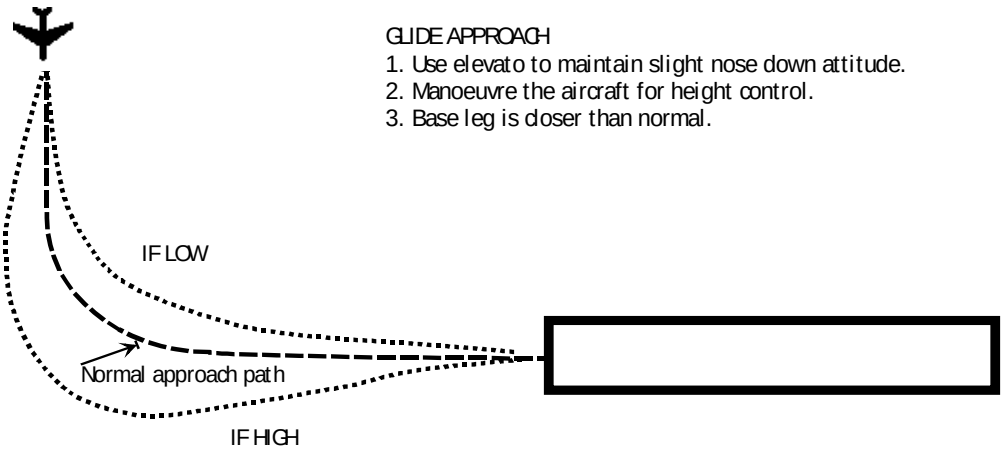
3.14.4. The importance of practice with less and less reliance on the instructor cannot be over-emphasized, however it is necessary that before too long, glide approaches must be taught and carried out for obvious reasons.

3.15 GLIDE APPROACH

3.15.1. The glide approach (usually due to engine failure or out of fuel) must be taught separate to and after the normal or on approach and landing sequences. The reason for this manoeuvre and its method of execution are entirely different. Basically the difference is that on a normal approach, power is used to place or position the aircraft on the correct approach path. On a glide approach, the approach angle is already predetermined, and the only way we can make a good landing on the field is to man oeuvre the aircraft during descent in order to vary distance from the landing field.

3.15.2. In early stages of training where an engine has stopped unexpectedly, it is important not to push the pupil into gliding the aircraft back onto the ground, 'somewhere' due to the high risk of damage. The pupil must not be led to believe that desperate situations are a normal part of our air sport. The glide approach is basically an emergency exercise, and like any other phase only proper instruction will enable the pupil to cope with this situation correctly. If engine stoppage does occur in earlier training, then this is an ideal opportunity for the instructor to tactfully take control and demonstrate this manoeuver, for its purpose is only too real.

3.15.3. The idea after the engine has stopped, is to try and position the aircraft on base leg. This is a position the pilot is most familiar with. Due to the steeper approach angle with no power, base leg is positioned slightly closer than would be under a power approach.



3.15.4. It is important to point out to the pupil that the NOSE ATTITUDE should be kept slightly low and MAINTAINED. This then controls our airspeed. The only way to make good an approach to the field is to MANOEUVRE the aircraft towards or away from the field to save or get rid of excess height respectively. If we were to use elevators for the purpose of height control, then the results would be similar to that described in the beginning of the approach section (see fig. 6).

3.15.5 The overshoot should be considered as an alternative continuation of the approach During the early stages of circuit practice the overshoot will be he normal option. A decision to overshoot should be made early, not when a situation has developed which becomes a last minute panic. Once the decision has been made, the first step is to regain airspeed, usually lost during the approach sequence. This is achieved by increasing throttle response. The heading of the model should be kept along the runway centre line maintaining wings level to the ground, until a safe airspeed and safe height has been reached, and, if flown correctly the model should rejoin the circuit on the crosswind leg as in Fig. 5.

3.16 CIRCUIT SPEED CONTROL

3.16.1. This section is aimed primarily at the more high performance aircraft and is an area often overlooked entirely. A normal reaction even amongst the more experienced fliers, to powered approaches, is not being able to 'get down' or 'slow down enough' for landings. In the majority of cases their speed on downwind is still normal cruise or at least excessive. Make no mistake, unless you are flying the slower and/or older type of aircraft, you MUST SLOW DOWN prior to entering or during the circuit appropriate to the aircraft type. The fact is and Note: DECELERATION IS GREATLY REDUCED on a descending flight path, so if they think they can slow down on base or final, then impress on them to forget it. Full size aircraft approach speeds, on late final , vary anything from ½ cruise speed for light aircraft to 1/3 to 1/4 FOR W.W.II fighters. Some high performance aircraft are already ½ cruise speed or less on downwind leg. Whilst various factors prevent the exact same ratios being used on model aircraft, the approximate relationship must surely apply. So the motto where applicable is "SLOW DOWN EARLY"!

3.17 CIRCUIT SIZE

3.17.1. Briefly, DON'T CROWD YOURSELF. Fly a couple of circuits for the pupil where necessary in order to indicate to him the approximate size, and make sure you do give him plenty of room. Remember he can't think as quick as you can at the early stages.

3.17.2. Usually with a powered approach there is a tendency to result in an overshoot situation. It is generally caused by the following in any combination:

a) Downwind leg too close.

b) Base leg too close.

c) Excessive speed prior to or during approach.

d) Tailwind component on base leg and/or final approach.

3.18 WIND EFFECT ON BASE LEG

3.18.1. Crosswind landing situations have for too long caused unnecessary trauma and fear, if this is passed onto the pupil, then he would want to land from all directions at even the slightest crosswind. Except for strong crosswinds, reasonable approaches and landings can still be made with very little extra effort, provided we are prepared in advance of certain relevant factors. Pupils must be made aware of these in order to prevent their circuits from becoming guessing games.

3.18.2. In crosswind landing situations we must have either a tailwind or headwind component on base. Our aim is still to intercept final approach at the same height as usual, so we must compensate for wind effect and this can ONLY BE DONE with appropriate use of POWER, assuming our circuit size is still the same.

3.18.3. Headwind on base: As it now takes extra time to travel on base leg we risk losing too much height. We have a choice of either delaying the standard power reductions or by leaving on a little extra power. As the time spent on base leg is generally about five seconds, the time frame is relatively small and it is recommended that power reduction be made at the standard place, but to leave a little extra power than normal, and remember to take it off as soon as you turn onto final.

3.18.4. Tailwind on base: Travel along base leg with a tailwind is very rapid. No sooner you're on base and its time to turn onto final. Any power reduction greater than normal has very little time to take effect and this is clearly inadequate. You must reduce power EARLIER than normal even if it means reducing on late downwind, so that there is no delay in initiating approach descent.

4. GENERAL OBSERVATIONS

4.1. It is wise to allow the pupil time to himself to practice without direct supervision. He needs this relaxation of authority, and the instructor his chance of a moment's break.

4.2. In the latter stages it is not unusual to find a situation where all aspects or flight are very good, with only perfection of he landing sequence remaining to be achieved.

4.3. Monotony can often be relieved here, by the introduction of some simple aerobatics. The loop should be taught first, as it is quite the simplest manoeuvre, yet has a very great mystique about it. In reality it requires use of only one control, and even that with no great precision in the simplest form.

4.4. The roll should be taught next, and is a much more difficult manoeuvre as it requires the coordinated use of elevator with rudder or aileron. It will also require that rudder or aileron travel be increased to allow a decent rate of roll, but by this stage the pupil should be able to handle this.

4.5. With the roll accomplished, the Immelman turn, Cuban eight, and split S turn can be easily added to the repertoire. One advantage of a working knowledge of simple aerobatics is that the pilot will be much better equipped to recover from unusual attitudes, he will also find his flying much more enjoyable.

4.6. During the course of this Instructor's Guide many references have been made to judgment of growing competence by the instructor. This judgment is something that takes time and experience to develop, as does each individual pupil. Instructing, or rather the art of instruction, is an art form in its own right, which can be raised to very high levels.

4.7. FINAL PUPIL BRIEFING

It is most important to emphasise to the pupil, once he/she has reached 'solo' standard that they are now at the basic minimum required standard and that to further improve, regular continuous flying practice is essential for overall enjoyment of the sport. Keeping a model in a serviceable and undamaged condition is directly related to consistency, especially close to the ground. In order to be reliable close to the ground, regular take-offs and landings should be practiced as often as possible, including both left hand and right hand circuits until all RESPONSES and reflexes become automatic. Additionally, at all stages of competence, fly within your own limitations. If it's too windy, wait for another day. If you wish to experiment with something new, do so at a safe height and, importantly think it out prior to attempting it. Especially about how you intend to recover from the new manoeuvre should you foul it up! Learn to walk before you can run. It helps keep models in one piece for your enjoyment!