Model Aviation's Sport Aviator
The e-zine for the new model pilot

Basic Landing Techniques

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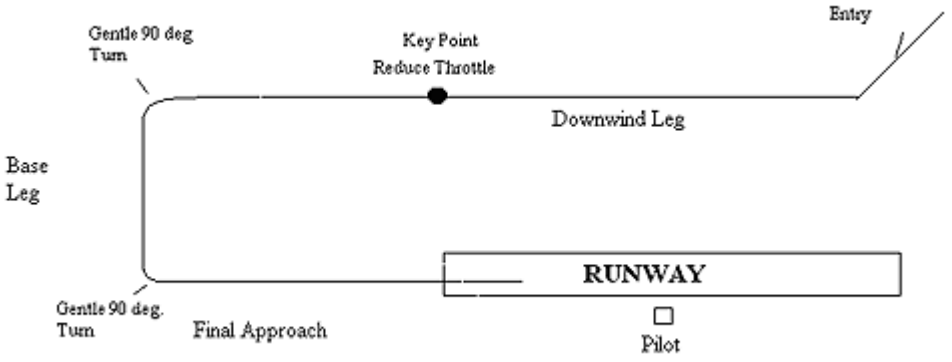
Of all the possible landing techniques, only two seem to be the most taught at model fields today. We'll cover the easiest to fly, and most useful, here in Part One. This first landing technique follows the full-size landing pattern. Part Two will cover the "Great Circle" Approach that is harder to fly and less useful, but has good visual appeal.
The standard pattern approach (Fig. 1) has been finalized during the last 75 years of full-size flying. It is useful in several ways. One is easy traffic separation at busy airports. While good for full-size, traffic separation is rarely critical at RC model fields where the pilots are standing within a few feet of each other. In addition, most RC pilots have truly impressive vocabulary tools they employ when another plane comes too close to theirs!

But the traditional full-size pattern approach has other major advantages for the RC pilot. A normal landing requires the pilot to manage several important aircraft parameters such as speed control, descent rate, attitude (the plane's, not the pilot's), wind correction, approach position and touchdown point. Managing these tasks while the plane is close to the ground and in the short time available before landing is sometimes difficult.

The traditional landing pattern separates these piloting tasks into single, discrete operations. This pattern also provides the pilot extra time in which to plan and adjust the approach as it develops. To see how this happens, we'll break each major section of the landing pattern into its component parts. For now, consider there is no wind and the plane is a standard 40-60 size trainer. Take a look at Fig. 1:



The first part is the pattern entry into the pattern's first section, or "Downwind Leg". While shown at a 45 deg. angle in the diagram, entry position is not as critical for RC. Entry can be made from almost any safe angle, even from the runway side (a "crosswind entry"). The plane should complete the entry at about an altitude of 200 feet, at half throttle and located 1-200 feet to the pilot's right (or left side if the approach is flown from the opposite end, a "Right Hand" pattern). The pilot flies the first part of the Downwind while maintaining straight, level flight. With no wind, the Downwind leg should be about 200 feet out from the runway.

No other piloting task is required during this section, just straight, level flight. When the plane reaches a point opposite the runway end, the Key Point, the pilot reduces throttle to 2-3 "notches"

above idle. The plane's nose will drop some and the plane will begin to descend. The pilot adjusts the descent angle by holding some "up" elevator while the plane is still flying straight. No other task is required at this time except to achieve the proper descent attitude. (Your instructor will help you achieve this attitude the first few times). Again only a single piloting task is required.

The pilot has 150 feet of straight flight to achieve the proper descent attitude. Usually, the fuselage is just slightly pointing downwards in most trainers. If the plane is at the proper attitude, but is descending faster than you would wish, add a notch or two of throttle. Do not raise the nose. Always remember, at any approach airspeed, throttle controls descent rate, elevators control airspeed. Raising the nose will only slow the airplane's speed due to increased drag and then the plane will descend MUCH FASTER. In fact, it may stall and then really descend faster.

Adding throttle provides extra air under the wing's center section and also over the tail. The extra lift slows the descent rate but doesn't really increase airspeed as long as the descent attitude is maintained. This seeming contradiction is harder for RC pilots to comprehend than it is for their full-size counterparts. Full-size pilots have only to feel the increased lift that the throttle provides, and watch their descent meter slow (actually called "rate-of-climb" gauge) while their airspeed indicator remains steady, to understand.
RC pilots just need to try this "up high" a few times at first. Fly past yourself about 250 feet high, at quarter throttle, in a sight descent and apply extra up elevator. Like a car going uphill, the plane gains some altitude but slows dramatically. Then the nose drops and the plane begins a steep descent. Make another pass in a shallow descent and apply a little extra throttle instead of elevator. The nose remains steady but the glide path becomes shallower.

Sorry for the digression, but that concept is important to every RC pilot, especially when flying high performance airplanes. We left the approach with the plane descending slightly and the throttle set 2-3 notches above idle. Next comes a gentle, max. 45 deg. bank, 90-degree turn into the "Base Leg". The same descent rate is maintained in the turn, add a notch of throttle if required. The turn is only 90 degrees; which is the easiest part of any turn since it is in the second 90 degrees of a turn where the plane slows and starts to drop. Actually this turn is over before the pilot realizes it. Again, just one piloting task is needed at any given time. The pilot only has to maintain straight, descending flight all through the Base Leg.

Then the plane is turned toward the runway with another gentle 90-degree turn. The plane is now headed towards the runway in straight descending flight. If the plane's touchdown point appears short of the point opposite the pilot, add throttle. If the landing might be past the pilot, called "long", remove those last 2-3 notches of throttle. Always maintain the descent attitude. If the airspeed appears too fast, add a little up elevator. If the plane is flying too slowly, you'll notice a very steep approach developing so add throttle and then release some up elevator. On the critical final approach, the pilot is only managing the touchdown point. Everything else has already been accomplished.

Once within 2-3 feet of the ground, just raise the nose slightly with up elevator, keeping everything else the same, and the plane will land main gear first in a straight line, right in front of the pilot. We did this approach with a trainer, but the same technique works for every plane from a scale fighter to a high performance Extra 300.

This all sounds great, but what about the wind? Thanks for asking. The pattern lets the pilot automatically adjust for crosswinds or for winds right down the runway, without any change in landing management. Consider a wind almost down the runway. All the pilot needs to do is to shorten the Downwind Leg after the Key Point! This shortens the Final Approach, reducing the amount of ground the plane has to cover. Since the plane has a slower ground speed on Final

Approach, it covers the shorter distance in the same time. Therefore the identical descent rate works for wind or no wind conditions (Fig. 2).

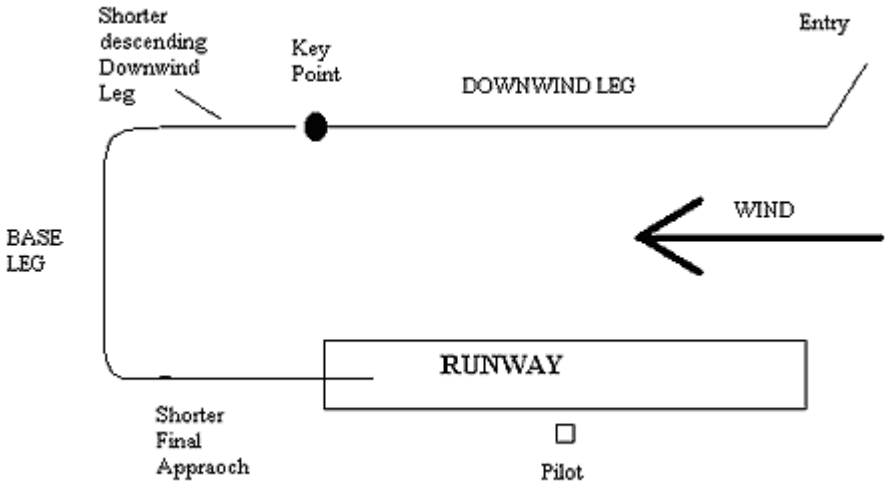


Fig. 2

How about a crosswind? Just move the Downwind Leg closer to, or further away from, the runway. This adjusts the length of the Base Leg. A shorter Base Leg reduces the distance the plane needs to fly if the Base Leg heads into the wind.

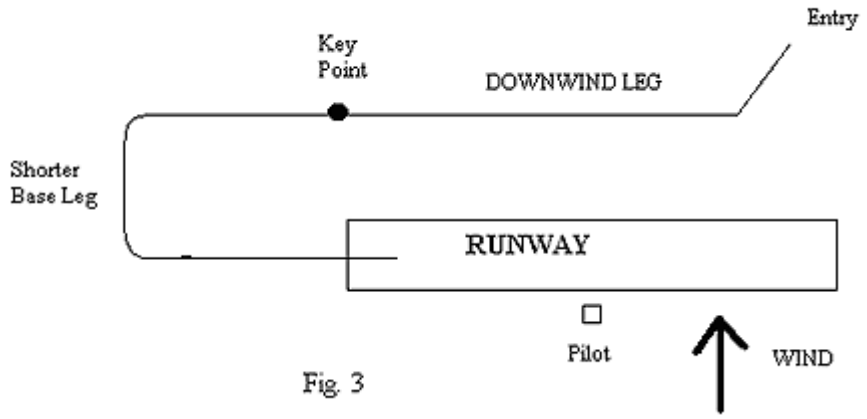


Fig. 3

In Fig. 3, the wind is from behind the pilot. Obviously, the plane's groundspeed during the Base Leg will be reduced. So the Downwind is flown closer to the runway to compensate for the Base Leg's reduced ground speed.

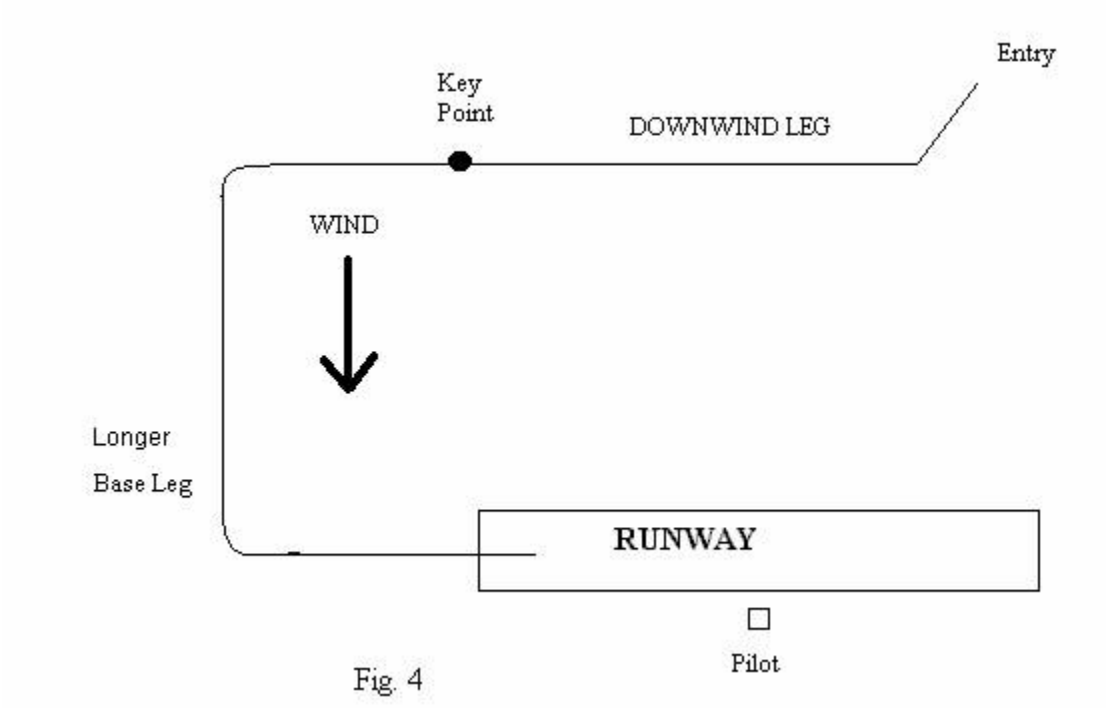


Fig. 4

If the crosswind is towards the runway (Fig. 4), fly the Downwind further away. The longer Base Leg compensates for the higher groundspeed. In cases where there is a 45-degree head/cross wind, move the Downwind and adjust its length as required.

There is one final wind adjustment. In order to compensate for any crosswind component, the plane must be flown headed slightly into the wind, especially on final approach. This has the effect of increasing the ground distance since the plane's movement is not all directed in a straight line. In this case, reduce throttle to 3-4 notches above idle at the Key Point instead of 2-3 notches. Remember more throttle means a slower descent rate and this compensates for the extra "distance".

That's it! The pilot needs to complete only one task at a time, no matter the wind conditions or the aircraft being flown. One size does fit all. Is it any wonder that full size pilots use this pattern? There is even an easy way to teach, or to learn, how to fly this approach. Again, there is only one change required. Raise the Downwind altitude from 200 to 300 feet. The student flys the approach as described. Instead of landing however, the plane crosses the intended touchdown point while still 100 feet high. The student then adds full throttle, climbs back to 300 feet and re-enters the Downwind. As the student becomes better at flying the pattern approach, begin to lower the Downwind's altitude about 25 feet at a time.

Most times, student pilots make their first landing without even realizing that they are landing! This eliminates the dreaded "fear of the ground" syndrome that affects some students when they see their plane and the ground in their sight picture for the first time. They are down before they even realize what is happening.

In addition, the full-throttle climb recoveries to Downwind altitude teach the student pilots how to do a proper "go-around" or "missed approach" if their landing attempt starts to go the wrong way.

The constant approach and climb practice even makes "touch and goes" easier for students to learn.

One other note, what happens if the little fan thingy in front of the engine stops during the approach? Anywhere past the Key Point, turn towards yourself, or the middle of the runway, *immediately*. If short of the Key Point, make a very small standard pattern and land.

Trainers glide slowly but do not cover a lot of ground distance in the glide. Apply only enough up elevator to maintain the same descending attitude used on the powered approach. If the plane appears to be landing short of the runway, LOWER the nose (release some up elevator) by about 10 degrees. DO NOT apply up elevator. More up elevator will slow the plane and make it land even shorter. Lowering the nose increases the airspeed and therefore the ground distance covered. Most trainers will make the runway from anywhere in this pattern if the engine quits.

The best landing engine rpm varies with the plane being flown. Most 40-60 sized trainers should be set so that the high trim idle is 2800-3000 rpm on the ground. Moving the throttle trim to half way should result in 2300-2400 rpm. Full low throttle trim should shut the engine off. Fly with the high trim to insure the engine doesn't quit during the flight. Reduce the trim to halfway just before entering the landing pattern. Shut the engine off before picking up the plane.

In Part Two, we'll cover the "Great Circle" approach. This landing approach was originally developed to land propeller driven aircraft onto straight deck aircraft carriers in the late 1920's. It is no longer used by navies today, but does have useful RC applications.

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