Landing

Your landings can be improved by remembering some of that stuff you were taught originally but now may have faded with time. Using some discipline in planning and executing your everyday landings will help you cope when the situation goes abnormal, such as in an engine failure.

In general, every successful landing has an element of pre-planning, followed by actually getting the aeroplane to a point from where a landing can be made.

Stabilised Approach

The key to any good landing is a stabilised approach – this means simply that you are at the right height, the right speed, and on the right approach path (ideally on the runway extended centreline) by a predetermined point. The larger the aircraft, the further from touchdown that predetermined point will be.

For example, a large transport aircraft should be on a stabilised approach by 1000 feet (agl) in IMC, or by 500 feet in VMC. On the three-degree glidepath used by these aircraft, these heights correspond respectively to 3.3 and 1.6 NM from touchdown. Lower figures usually apply to light aircraft, and may vary between operators or training organisations.

Possibly the lowest stabilised approach point you will see is on an agricultural operation. These pilots are well-practised, making many landings per hour, and have the 'arrival' down to a fine art. The roll-out on to final may blend smoothly into the round-out, closely followed by touchdown. The keyword here of course is 'practice'.

Back to the Basics

Getting to the stabilised-approach point is probably best achieved by flying an accurate circuit, and completing all pre-landing checks early so that you can focus on accuracy and finesse. By circuit, we mean at least three legs of the standard circuit, ie, the downwind leg, base leg and final. Learning the cues for joining on base or final takes time and practice, and these aspects can be explored when you've mastered the basics.

Downwind

The standard height for the downwind leg is normally 1000 feet agl, but some aerodrome operators specify different heights for terrain or mixed-traffic reasons. If you are flying to an unfamiliar aerodrome, check the data on the relevant AIP aerodrome chart beforehand.

Training organisations, depending on the type of aircraft used, will teach runway spacing on the downwind leg by reference to some feature on the wing, be it a paint line, fuel cap, or a certain point on the strut of a high-wing aircraft.

Using the wing itself as a virtual T-square can help you fly parallel with the runway, applying drift corrections as required if there is a crosswind at circuit height. Once you've got that sorted, note the heading and/or the wing/runway angle, and use these next time round if on repetitive circuits. After you've completed your pre-landing checks, the remainder of the downwind leg is a good opportunity for some practice on accurate altitude control.

Maintain a good lookout, and keep a mental picture of where any other traffic is. Make your own radio calls clear and concise, and at the correct time or position.

Base Turn

The turn on to base leg is usually begun when the landing threshold is in your half-past-seven position (on a left-hand circuit). That's 45 degrees back over your left shoulder, in other words. For a right-hand circuit, read half-past-four position and right shoulder respectively.

Starting the base turn, apply carb heat if applicable, and smoothly reduce power to the setting that you estimate will carry you to the threshold without any huge variations. Many organisations use 1500 rpm as a start point, and this can be varied as spacing and anticipated headwind on final dictate.

Maintain height initially, allowing airspeed to reduce into the flap operating range (white arc on the airspeed indicator). Select approach flap, lower the nose to maintain the desired initial approach speed, and trim.

In nil wind conditions, roll out of the turn when the aircraft is at right angles to the runway extended centreline. If there is wind present, a suitable allowance for drift should be made.

Photo courtesy of Kaye Nairn.

Base Leg

The descent on base leg is adjusted with power, so as to complete the turn on to final by about 500 feet agl. If the downwind leg has been extended to accommodate other traffic, or at ATC request, this will mean that the aircraft will be further out from the runway threshold at 500 feet if no compensating action is taken.

In this case, the descent can be delayed so that the turn on to final can be completed at a height appropriate to the distance from the runway.

Using the three-degree glidepath as an example again, 500 feet agl puts the aircraft about 1.6 NM from touchdown; and if the aircraft were established on final at 800 feet, the corresponding distance would be about 2.4 NM.

Lookout is equally important on the base leg, particularly for any unannounced traffic on a long final. Also beware of the situation where a low-wing aeroplane is on approach with a high-wing aeroplane slightly ahead and lower – in this case the pilots' view of the other aircraft is blocked by the wing, and the risk of collision increases.

Final

Once the aircraft is established on final, select landing flap as required, adjust approach speed if necessary, and trim. Check your sight picture to verify that you are on the desired glidepath, and nominate your aim point if you don't already have one.

This could be the 'piano keys', the 'numbers' or the 1000-foot (300 m) markers if you're landing on a sealed runway.

The aim point is where you want the wheels to gently kiss Mother Earth on arrival, so the task from here on in is to make that happen. Airspeed is controlled by attitude, and rate of descent by power. Large power changes shouldn't be needed, except perhaps to compensate for unexpected sink or lift on final.

If the aircraft is maintaining the correct glideslope, the aim point should remain static in your field of view. If you are getting low on the approach, it will appear to move up the windshield; conversely, if you are getting high, it will appear to move down. Adjust power as soon as you spot the trend, but be prepared to readjust as soon as you've achieved your correct sight picture.

Airspeed

Depending on how you were taught, you will either make the approach at a constant speed, or progressively reduce to your pre-calculated target threshold speed on short final. The latter method is necessary when your performance calculations show that there's just enough runway length for you to land comfortably.

In a gusting wind situation, it's normal to add half the gust spread to your approach speed. Say the wind is 20 knots gusting 32, take the difference of 12 knots, halve it (6) and add the result to your approach speed.

Decisions

We mentioned the stabilised approach earlier in the article. If at any stage on final, it appears that the approach is diverging from optimum – for example, 150 feet too high or 12 knots too fast and this will result in a long landing, **go around**. There's no shame in doing this, and one day this action may save your life.

Full power, carb heat off, climb attitude and airspeed set, and flap raised in stages. From there, perform another circuit and once back on final, apply the lessons learnt on the first attempt.

Another decision point you should identify is the end of the touchdown zone, ie, the point at which you will go around if the wheels aren't on the ground. This is particularly critical where there is limited runway length. That fence at the other end can come up really quickly sometimes!

Nearly on the Ground

On very short final, you cross the fence and the runway threshold, and now it's time to slow down the rate of descent to a point where it's close to zero as the wheels touch the runway.

This phase is the 'round-out' or 'flare', and is begun around 50 feet, more or less depending on the size of the aircraft. The throttle is closed – gently – at this point. Remembering back to the effects of controls lesson, watch for and counteract the tendency of the nose to drop when power is reduced.

Judging height above the runway takes practice, and a hint is to look ahead to the far end of the runway. In the flare, progressively raise the nose to 'meet the end of the runway' as the runway appears to flatten out, also using the far end as your directional reference. Your peripheral view of the area to the left of the nose will also help your height perception. Keep your eyes scanning, however, and don't fixate on a single point.

Ideally, you should 'hold off' until just before the wing reaches the stalling angle, then allow the aircraft to settle gently on to the main wheels. (We're assuming a tricycle-gear aeroplane here.) Lower the nose wheel gently to the ground while you still have elevator effectiveness, and concentrate on keeping straight.

Brake as required, raise flap when it is safe to do so, and taxi clear of the runway. Complete after-landing checks as appropriate, and don't forget to terminate your flight plan or cancel SARTIME.

Further Reading

This article assumed a basic training aircraft, a private pilot building experience, and a benign surface wind environment. For pilots seeking to improve and hone their skills, Flying New Zealand's regional and national competitions are a good forum in which to benchmark your performance.

A range of guidance material is available on the CAA web site, www.caa.govt.nz, or for GAP booklets or posters, on request to info@caa.govt.nz:

» The GAP booklet *Takeoff and Landing Performance*

» The "Standard Overhead Join" poster.

Vector articles:

» "Short-Field Landings" (November/December 2007)

» "Taildraggers 101" (September/October 2009)

» "Runway Excursions" (September/October 2011)

» "Crosswind Landings" (March/April 2007)

» "Wind Shear for the Light Aircraft Pilot" (January/February 2013). ■