



# Short-Field Landings

A 'short-field landing' is an exercise in precision – it is a landing on a runway shorter than that normally available for the conditions but still sufficient for landing. It is not for a runway that is too short, or where the runway length is unknown. It is a normal operational procedure.

Landing on a runway that is too short, or one where the length is unknown, may be the only available option in a precautionary landing situation, but this is an emergency procedure. The approach technique is the same, even if the end of the landing roll may be other than normal.

The considerations discussed in this article also apply to airstrips and farm paddocks, although it is not intended to cover these to any degree – strip operation is a specialised area of training in itself.

## Will We Fit?

### Group Rating Number

The group rating number can be used to establish performance compliance for aeroplanes with a MCTOW of 2270 kg or less, for private operations only. Each runway for which details are published in *AIP New Zealand* is allocated a performance group rating number, and up to 1 April 1997, when Civil Aviation Safety Order (CASO) 4 was revoked, light aeroplanes were allocated a group rating number (1 to 8) by means of a flight manual supplement. If the aircraft flight manual still contains reference to the group rating number, then this system may still be used. Group rating numbers are no longer allocated to aircraft when they are placed on the register.

A runway with a group rating of 6, for example, can accommodate aircraft with a group rating number of 1 to 6. If you were flying a group 6 aeroplane onto a group 6 runway, the system does have some safety

factors built in, but if there is any doubt, another method should be used.

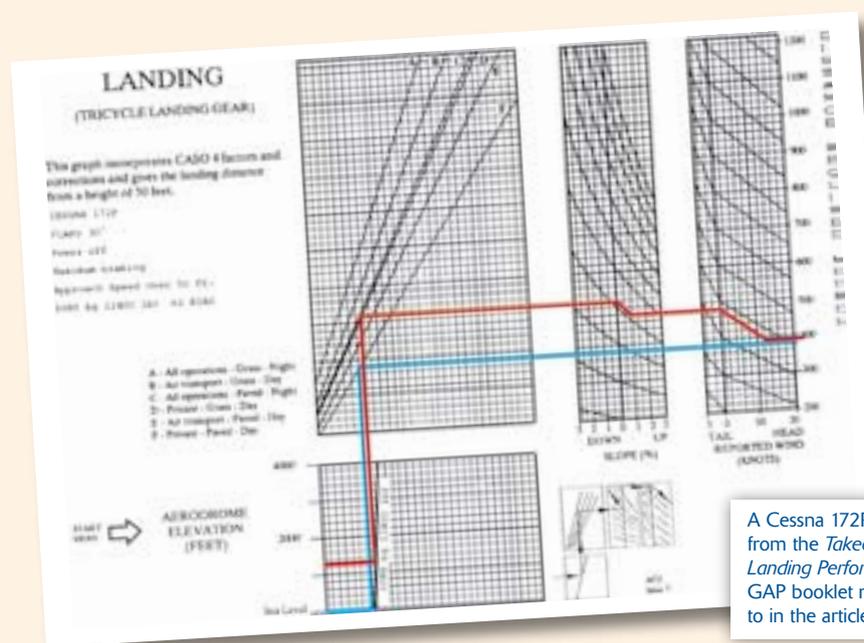
Note that some runways have different group rating numbers for the takeoff and landing cases, and may also differ in the reciprocal direction, as dictated by slope or by obstacle clearance requirements.

### P-Charts

These charts formed part of aeroplane flight manuals during the currency of CASO 4, but in most cases have been retained "for information only". They are no longer issued as a flight manual supplement. Their use to determine aircraft performance is still perfectly acceptable, however, and is more precise than the group rating system. You may even find that your group 6 aeroplane will be able to use a group 5 runway under certain conditions. P-charts apply various factors, including density

altitude (for the takeoff case), type of operation, runway surface and slope, and wind to determine required takeoff and landing distances for a particular set of conditions.

If a set of P-charts is not already available for your aircraft, *Advisory Circular 119-3 Air Operator Certification – Part 135 Operations* contains a section (Appendix C) on how to develop a set. Performance data from the aircraft flight manual is transposed onto the charts to give the starting points for applying the various factors. For the landing case, use the flight manual figures for the distance required from a threshold height of 50 feet, not just the ground roll distance. Some manuals will quote this distance "over a 50-foot obstacle" – this is misleading, as the 50 feet is a theoretical screen height which is part of the certification process.



A Cessna 172P P-chart from the *Takeoff and Landing Performance GAP* booklet referred to in the article.

Once a chart has been created, it is a quick and convenient method of establishing runway length requirements.

## Flight Manual Data

The flight manual data may also be used, with appropriate corrections (see *Advisory Circular 91-3 Aeroplane performance under Part 91*).

The flight manual figures must be treated with caution. They are the best figures that the manufacturer could obtain, and to quote from a Cessna flight manual,

The above performance figures are based on the indicated weights, standard atmospheric conditions, level, hard-surfaced dry runways and no wind. They are calculated values derived from flight tests conducted by The Cessna Aircraft Company under carefully documented conditions and will vary with individual airplanes and numerous factors affecting flight performance.

In short, these figures have been established by experts with new aircraft in ideal conditions. The average GA pilot will be hard-pressed to achieve the same results.

The landing distance figures are obtained with the aircraft at 50 feet over the threshold, at an airspeed of 1.3 times the stalling speed in the landing configuration. For the example used in the GAP booklet *Takeoff and Landing Performance*, a Cessna 172P, this is 61 knots indicated. Any excess height or speed at the threshold will increase the landing distance. Note also that the flight manual figures are predicated on maximum braking.

The basic flight manual figures need to be corrected for not only surface type, slope and wind, but also the type of operation. The P-charts have these factors built in, but it will be readily seen that air transport operations require more landing distance than private operations – in other words, a greater safety factor is incorporated. When using a ‘private operations’ landing distance that is only slightly less than the distance available, be very careful – test-pilot accuracy will be required. Is your standard of flying equal to the task? How current are you? If you have any doubts, abandon the attempt, the earlier the better.

Beware particularly of landings on short wet grass – braking action will be minimal

to non-existent, and a considerable extra length needs to be allowed for landing. Fresh clover reputedly has similar properties without having to be wet. The UK CAA’s *SafetySense Leaflet 7C* quotes a factor of 1.6 for short wet grass (ie, multiply the original calculated distance by 1.6). Even for a paved runway, Part 135 operations are required to allow 115 percent of the distance required for landing on a dry runway – and note also that the dry runway distance cannot exceed 85 percent of the available length.

## Doing It

Having determined that you can land safely on a particular runway or strip, you need to set the aeroplane up in the correct configuration, at the correct speed and height, in order to achieve the landing in the distance available.

- On the downwind leg, confirm the conditions for the approach and the threshold speed, and choose an aim point.
- In gusting wind conditions, add half the gust range to the original target threshold speed – ie, if the wind is 15 to 25 knots, add half the difference, five knots. Just make sure that you have judged the wind direction correctly, and reassess this throughout the approach.
- Adjust the base turn point so that some power will be used throughout the entire approach – this will enhance elevator effectiveness, particularly during the flare.
- Monitor the approach path with respect to the aiming point, adjusting power as required to control the rate and angle of descent.

- Select full flap once established on final, and progressively reduce airspeed to achieve the target threshold speed ( $V_{TH}$ ) by about 200 feet agl.
- If the aircraft is not properly configured by 200 feet agl, on centre-line, on glideslope, aim point identified and airspeed correct – or the landing is not assured for any reason – go around.
- Carry some power right into the flare, and carry out the landing in one phase – the round-out and hold-off are combined to reduce the rate of descent to zero as the main wheels touch the ground and the throttle is closed.
- You should have a previously identified point on or beside the runway at which you will go around if the wheels are not on the ground. This is extremely important where there is no surplus runway length available. Call the point a ‘decision point’ if you will, even though the decision has already been made. At that point, if you aren’t on the ground, there is no decision – you must go around.
- Lower the nosewheel, then apply braking as required (don’t lock the wheels as this will reduce braking effectiveness), holding up-elevator to reduce weight on the nosewheel.
- Raise flap on completion of the landing roll. ■

### Further Reading:

Civil Aviation Rules 91.201, 135.211, 135.223, 135.25.

Advisory Circulars AC91-3, AC119-3, AC139-7.

GAP Booklets *Takeoff and Landing Performance* and *Flight Instructor’s Guide*.



The end result of a well planned and executed landing.

**Don’t forget to amend SARTIME or terminate your flight plan!**