Guidance Notes

PRIVATE AND COMMERCIAL PILOT TRAINING

Power-Off Accuracy Approaches

September 2005

1st Edition

ACKNOWLEDGEMENT

Transport Canada thanks the Federal Aviation Administration of the United States for their permission to use the chapter on power-off accuracy approaches in the FAA Airplane Flying Handbook as source material for these guidance notes.

The original text is located in Chapter 8 of FAA-H-8083-3A Airplane Flying Handbook.

INTRODUCTION

Power-off approaches are made by gliding an aeroplane with the engine(s) idling to a selected point on the runway. The objective is to develop the skills required to execute a gliding approach from circuit height and land safely on a specified touchdown point with a degree of accuracy.

The ability to estimate accurately the distance an aeroplane will glide to a specific point will determine the amount of manoeuvring that may be required from a given altitude. With practice, heights up to 1000 feet above ground level can be estimated with fair accuracy by learning to associate the indications of the altimeter with the general appearance of the terrain. Above this altitude, the estimation of heights becomes less precise, as all features on the ground tend to merge.

Early on in flight training, during the practice of descents and, prior to the first solo, when conducting simulated engine failures in the circuit, selecting and maintaining the proper glide speed and angle is practised and reinforced.

Eventually, the judgment of heights becomes less important than the ability to estimate the glide angle. The pilot who knows the glide angle of an aeroplane can, with reasonable accuracy, estimate the approximate spot along a given ground path where it will land, regardless of altitude, and then judge how much manoeuvring is possible or required during the glide.

SAFETY

Although some of the skills required to perform these manoeuvres are similar to those demonstrated during forced landings, power-off approaches are not emergency procedures. Procedures required by aircraft manufacturers to safely land an aeroplane without power in an emergency are not obligatory for this flight test item.

The main objective of an accuracy approach is to complete a safe landing. Forcing an aircraft that is approaching too high or too fast onto a desired landing area will always sacrifice some degree of safety. Pilots should decide early whether a safe touchdown could be achieved. When demonstrating the 180º accuracy approach and landing on a commercial pilot flight test, the decision to overshoot must be favoured over the risks of an unsafe landing.

It is very important to pay attention to engine operating temperatures when carrying out manoeuvres with decreased power settings. Prolonged operation without engine power, especially in colder temperatures, may require the periodic application of power to warm the engine. One application of power should be sufficient to maintain safe engine operating temperatures, during the practice of a power-off 180° accuracy approach.

To protect the engine in very cold conditions, it can be acceptable to use a low power setting and partial flap (in order to compensate for the added thrust) and simulate power-off gliding performance. As this may change the glide attitude and limit the range of flap left available for corrections, this technique should only be used to protect the engine.

Carburettor heat must be used as specified by the manufacturer during prolonged approaches so that additional power would be available when required to correct an undershoot or initiate an overshoot.

Pilots should ensure that other traffic is not inconvenienced by the manoeuvres required to conduct this type of approach and that air traffic service, where it is provided, is kept informed of the pilot's intentions.

Power-Off Accuracy Approaches

General

The objective of a successful approach is to position the aeroplane in the desired landing area at an airspeed that results in the expected amount of floating before touchdown. In order to accomplish this, the flight path, approach airspeed and glide angle must be accurately controlled.

The glide angle can be steepened with the use of flaps, small pitch adjustments or sideslips. Raising the pitch attitude in a low approach, in an attempt to 'stretch' the glide, will cause the aeroplane to sink more rapidly due to a lower airspeed that results in diminished lift, moving the desired touchdown point out of reach. Lowering the pitch attitude in a high approach increases airspeed, forcing the aeroplane to float past the desired touchdown point. It is therefore very important to judge the approach accurately and make adjustment decisions **early** in order to achieve a safe, successful landing.

Uniform approach patterns such as the straight-in, 90° and 180° power-off accuracy approaches are described further on the following pages. Practice in these approaches provides the pilot with a basis on which to develop judgement in gliding distance and in planning an approach.

It must be emphasized that, although accurate spot touchdowns are gratifying, safe and properly executed approaches and landings are more important. Pilots must not sacrifice procedures in order to land on a desired spot.

Straight–in Gliding Approach

The skills required to execute a successful gliding approach to a desired landing area are developed during basic descent training. It is during this phase of training that pilots learn to estimate gliding distances using visual cues.

1. Positions on the ground that appear to move down a fixed point on the windshield are ground positions that you can reach and fly over, with height to spare.

2. The position on the ground that remains stationary in relation to the fixed point on the windshield is the ground position that your aircraft should reach.

3. Positions on the ground that move up from a fixed point on the windshield are ground positions that your aircraft cannot reach.

These simple observations should be used whenever estimating the power-off gliding range of an aeroplane or attempting a power-off gliding approach to a desired landing spot on a runway.

As the power remains in the idle position for this approach, adjustments in glide angle and distance are possible through pitch changes, flap settings and slipping, all of which can result in airspeed changes. These airspeed changes must be carefully considered:

- Pitching up from a glide attitude to correct a low approach will decrease the airspeed and the gliding range, resulting in wheel contact before the desired landing area. In this situation, it would be better to overshoot and try again.

- Pitching down from a glide attitude to correct a high approach will increase the airspeed and diminish the gliding range, resulting in additional lift that may carry the aircraft beyond the desired landing area. In this situation, it would be better to lower flaps or slip to reposition the aeroplane on the appropriate glide path.
- In all cases, it is recommended to carry out a missed approach and try again, whenever a pilot is not satisfied with the situation.

This is not an emergency procedure and a landing in the desired area does not have to be achieved every time. The power-off approaches discussed in these guidance notes require practice and experience to master. To develop the judgment required to successfully reach the desired landing area every time, the straight-in gliding approach should be practised from different altitudes, distances from the runway and under various wind conditions.

90° Power-Off Approach

The 90° power-off approach is made from the base leg and requires only a turn onto the final approach. The approach path may be varied by moving the base leg closer to or farther out from the approach end of the runway, depending on wind conditions (Figure1).

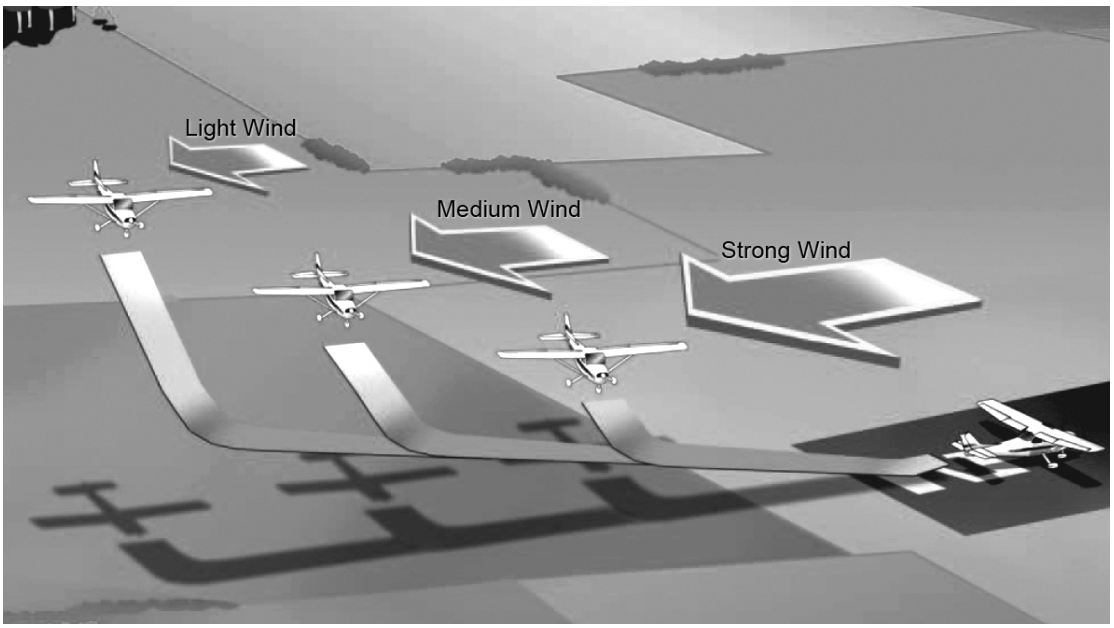

Figure 1

The glide from the key position on the base leg through a turn to the final approach is the final part of most accuracy landing manoeuvres.

The 90° power-off approach begins from a rectangular circuit at approximately 1000 feet above the ground. The aeroplane should be flown onto a downwind leg at approximately the same distance from the runway as in a normal circuit. If appropriate to the airport procedures

and when some proficiency has been achieved, the procedure can be attempted when joining straight into the base leg. The before-landing checklist should be completed on the downwind leg, including extension of the landing gear, if so equipped.

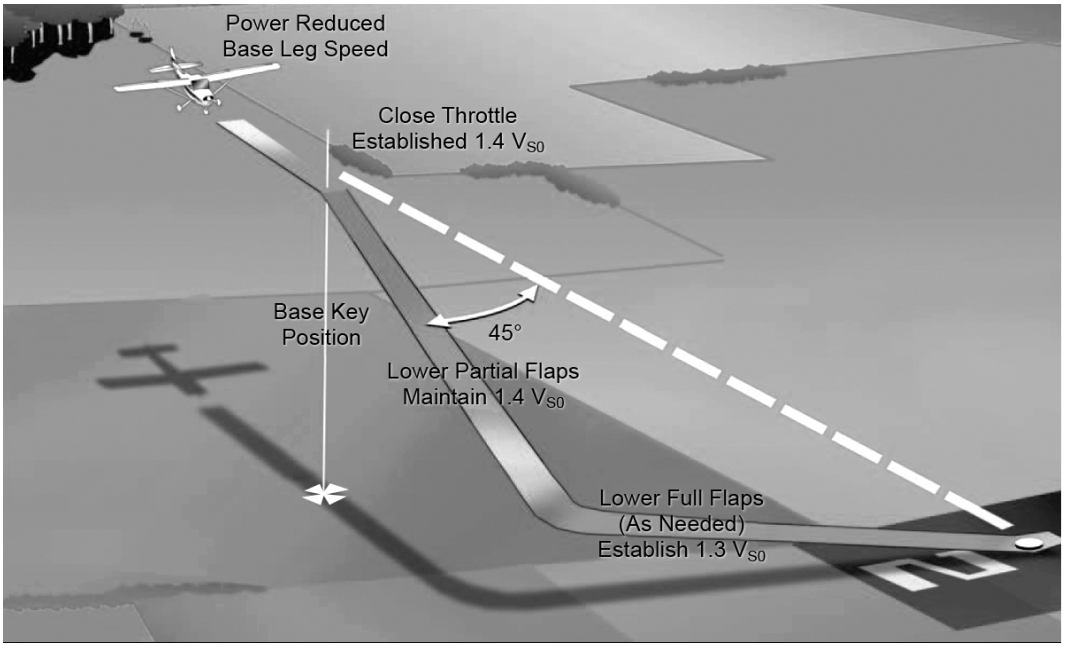

Figure 2

After a medium banked turn onto the base leg is completed, power is reduced slightly and the aeroplane is decelerated to the normal base leg speed (Figure 2). On the base leg, the airspeed, wind drift correction and altitude should be maintained while proceeding to the 45° position. At this position, the landing area will appear to be on a 45° angle from the aeroplane's nose.

The pilot can determine the strength and direction of the wind from the amount of crab necessary to hold the desired ground track on the base

leg. This will help in planning the turn onto the final approach and in lowering the correct amount of flaps.

At the 45° key position, the throttle should be closed completely, the propeller control (if equipped) advanced to high RPM and altitude maintained until the airspeed has decreased to the manufacturer's recommended glide speed. In the absence of a recommended speed, 1.4 V_{so} may be used. When the desired airspeed is attained, pitch should be adjusted to maintain the glide speed and then the controls should be trimmed.

The base-to-final turn should be planned so that the aeroplane will be aligned with the runway centreline upon completion. On final approach, visual cues, as explained earlier, should be used to determine the touchdown point. Flaps or slipping can then help to move that touchdown point, as necessary, to the desired landing area. Slight adjustments to both the pitch attitude and the trim may be required to maintain the proper glide angle and airspeed. Once the final approach glide has been established, attention can be directed to landing rather than concentrating on the touchdown point. Pilots must keep in mind that it is better to execute a safe landing 400 feet from the intended touchdown point than to force the aeroplane into a poor landing, precisely on the mark.

180° Power-Off Approach

This approach is executed by gliding with the power off from a given point on the downwind to a pre-selected landing area. It is an extension of the principles involved in the 90° power-off approach. Its objective is to further develop judgment in estimating distances and glide ratios.

The 180° power-off approach requires more planning and judgment than the 90° power-off approach. This type of approach should be started from the downwind, usually 1000 feet above the ground.

The throttle is reduced to idle and altitude is maintained while the aeroplane is decelerated to the manufacturers recommended glide speed or 1.4 V_{SO} when abeam the desired landing spot, at the downwind key position (Figure 3).

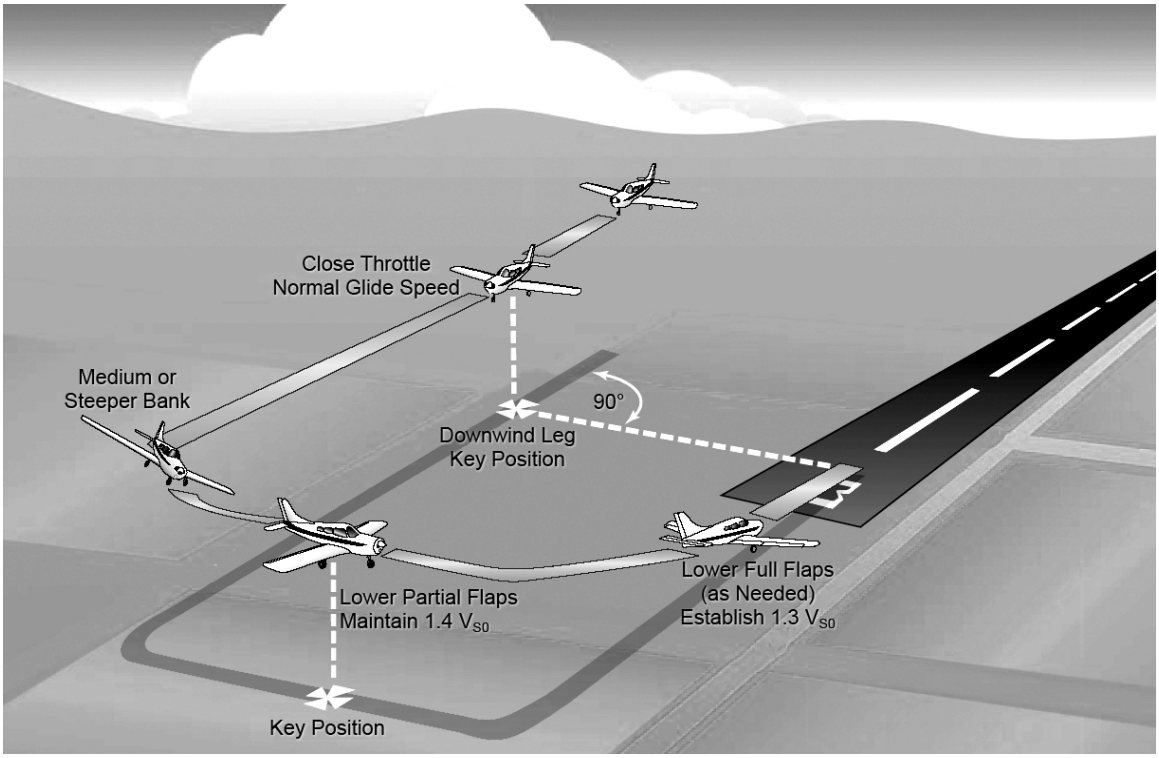

Figure 3

The bank angle, when turning from the downwind leg to the base leg, will depend upon the glide angle and the velocity of the wind. This turn should be distanced as needed for the altitude and wind conditions. The turn onto the base leg should be made at an altitude high and close enough to glide the aeroplane to what would normally be the base key position in a 90° power-off approach. Although the key position is important, it must not be overemphasized nor considered as a fixed point on the ground. Many inexperienced pilots may think of it as a particular landmark in the circuit, such as a tree, a crossroad or other visual reference, to be reached at a certain altitude. This may leave the pilot at a loss, any time such objects are not present. Both altitude and geographical location should be varied as much as practical to eliminate such habits.

After reaching the base key position, the approach and landing are the same as in the 90° power-off approach.