12 - APPROACH CONTROL

Approach control is the first exercise where judgement and decision-making figure importantly. There are two parts to Approach Control:

- (1) judging whether the glider is overshooting or undershooting by observing the apparent movement of the Reference Point (RP) in relation to the canopy, and making any corrections necessary
- (2) judging the steepness or shallowness of the approach, and deciding how (or if) to correct it to the optimum airbrake approach. (Needs emphasising after circuit planning has been covered).

Before introducing this exercise formally, the trainee should have:

- good elevator, aileron and rudder coordination
- good speed control
- good directional control, particularly in straight lines
- flown the approach - possibly the round-out and landing - to a good standard, with the instructor prompting use of the airbrakes
- completed satisfactorily the Effects of Airbrakes exercises [chapter 11].

BRIEFING POINTS

Using the RP technique enables us to:

- land the glider precisely where required
- helps us recognise whether we are undershooting or overshooting, and is applicable equally to final glides and field landings.

Approaching towards a relatively featureless surface such as grass or tarmac can be awkward. To make things easier, an RP can be chosen from the low key area, in relation to some definite object on or near the landing area, such as a car or parked glider. Once on the approach don't be drawn to fly directly towards the object. In practice, when the RP is chosen from the low key area it is more of a reference area; the level of ground detail isn't usually sufficient for it to be anything else. It becomes a reference 'point' when the glider is on the approach.

- movement of the RP up or down the canopy shows how the glider is moving in relation to a path targeted on the reference point. It doesn't indicate whether the glider has started the approach high or low. [See chapters 14 & 15 for more on this]
- the descent path is controlled by the airbrakes
- the approach speed is controlled by the elevator, with reference to the attitude **and** the ASI
- it may be necessary to change the amount of airbrake, e.g. reducing it through a wind gradient.

If the RP appears to move down in relation to the canopy then the glider is overshooting, but this is only true if the attitude and speed are constant. If the RP appears to move up in relation to the canopy then the glider is undershooting, and again this is only true if the attitude and speed are constant.

If the RP appears stationary in relation to the canopy and both the attitude and the speed remain constant, then the glider is approaching the RP correctly.

> To avoid the implication that the elevator is used to 'aim' the glider at a spot on the ground, use the words '**Reference point**' (RP) rather than 'aiming point'.

In theory, the ideal descent path is with half airbrake (figures 2 and 3, next page). In practice, aim for approximately two-thirds airbrake as this allows a greater margin for recovering from an undershoot.

Once the round-out has begun (figure 1, next page) the RP is of no further use. As the glider nears the round-out point, transfer attention further ahead in order to obtain the needed visual clues to height, float and landing. Keep checking that the speed remains safe. Any unwanted loss of speed near the ground requires either a reduction in the amount of airbrake, or their closure.

DEMONSTRATION

The standard/normal procedure is to arrive at the final turn at an appropriate height and position, turn onto the approach, roll the wings level, check the airspeed and only open the airbrakes when the glider can achieve a half to two thirds full airbrake approach.

There are two approach control demonstrations. The first demonstrates a normal approach, and the second demonstrates an undershoot and overshoot. The undershoot and overshoot do not have to be done on the same flight. Sometimes it's easier to demonstrate the overshoot one one flight and the undershoot on another.

First demonstration - the normal approach

- tell the trainee that you will fly the approach and landing
- as you pass abeam the landing area, agree an RP, perhaps in relation to a parked glider or car
- the trainee should follow through on the controls, including the airbrakes
- make the final turn between 500' to 700'; higher than normal - slightly further back to allow for what follows - to give time for the demonstration
- on rolling wings level, encourage the trainee to check the airspeed
- do a normal 2/3 brake approach with no apparent movement of the RP relative to the canopy. Make the point that the airbrakes aren't opened automatically as the glider rolls out of the final turn (landing lever syndrome), but that the glider has to intercept the 2/3 brake approach line first. Emphasise the steady speed and attitude maintained throughout the whole approach.

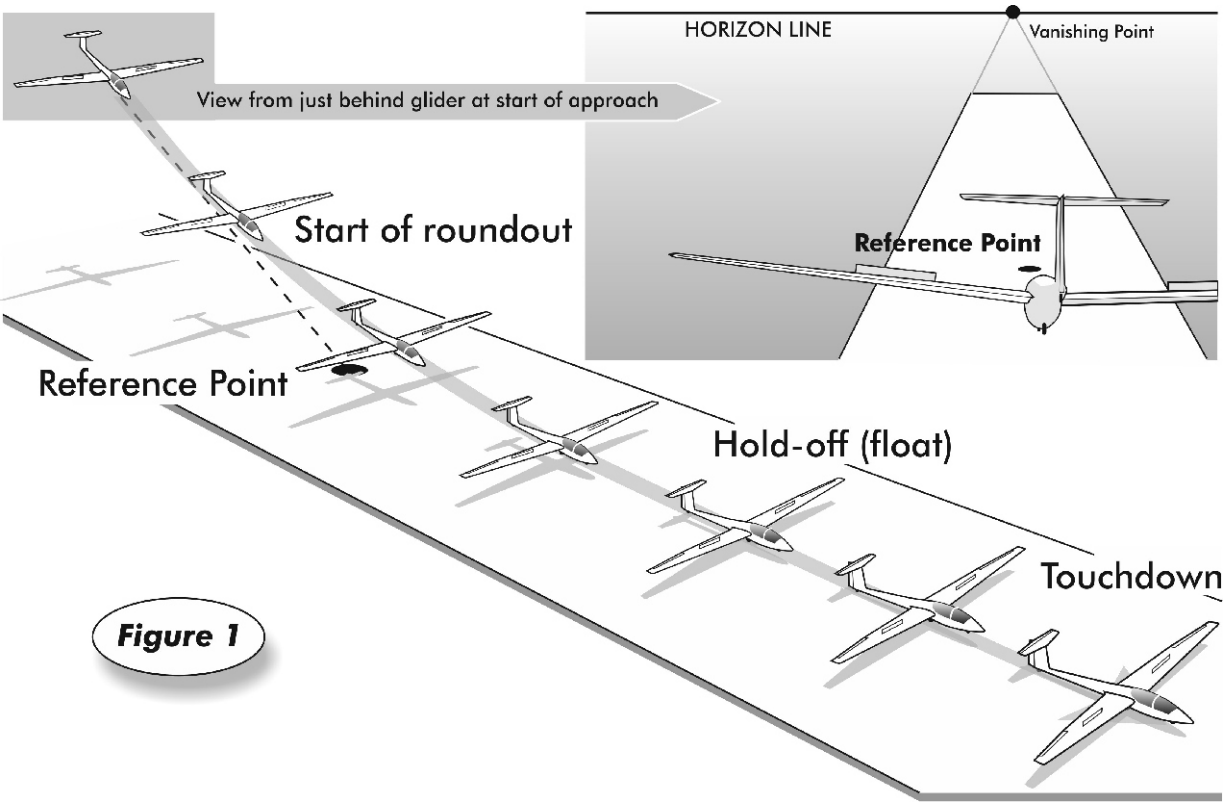

Figure 1

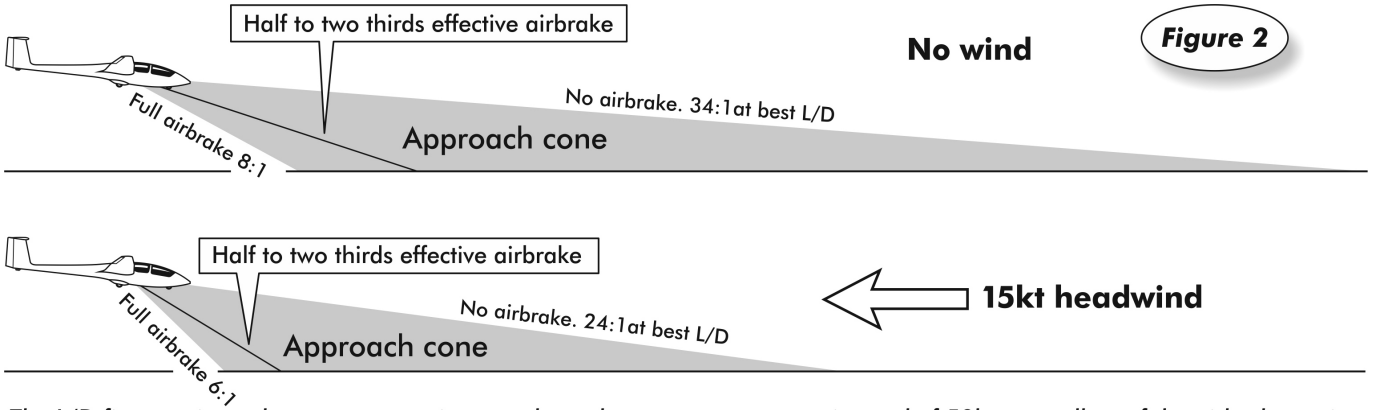

Figure 2

The L/D figures given above are approximate only, and assume a constant airspeed of 50kt, regardless of the airbrake setting. Note: an AS-K21's minimum approach speed with full air brake and at max AUW, is 56kt. 50kt will result in a crash.

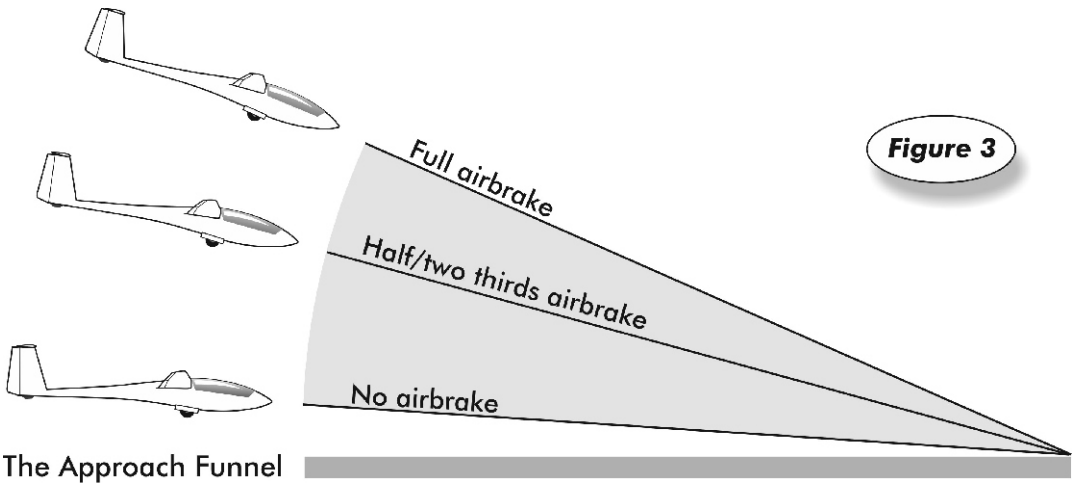

Figure 3

Second demo - the undershoot/overshoot

It is preferable to demonstrate the overshoot on one flight and the undershoot on another.

- tell the trainee that you will fly the approach and landing
- as you pass abeam the landing area, agree an RP, possibly in relation to a parked glider or car
- the trainee should follow through on the controls, including the airbrakes
- make the final turn between 500'-700'; higher than normal, to give time for the demonstration
- demonstrate an undershoot, pointing out how the RP moves in relation to the canopy. Emphasise the steady speed and attitude
- demonstrate an overshoot and point out the movement of the RP in relation to the canopy. Emphasise the steady speed and attitude
- demonstrate a return to the normal 2/3 airbrake approach, then demonstrate no apparent movement of the RP in relation to the canopy. Emphasise the steady speed and attitude.

The demonstration is easier for the instructor if the undershoot is shown first. If the wind is strong, either choose an RP well into the field, or first demonstrate the overshoot case.

DE-BRIEFING

- the reasons for using an RP
- how to recognise undershooting and overshooting
- why the attitude and airspeed need to be steady when judging the apparent movement of the RP
- how the elevator controls the speed, and the airbrakes control the descent path. Why it's not the other way round
- the advantages of a two-thirds airbrake approach
- the need to assess the progress of the approach before opening the airbrakes ie., no automatic 'going into land lever' reactions (see additional comments in Common Difficulties).

TRAINEE'S ATTEMPTS

The trainee's attempts at using the RP techniques shouldn't be aimed at slavishly copying the demonstrations, but at gaining an understanding of, and feel for, the principles involved:

- to give the trainee plenty of time, their first attempts should be during long approaches
- subsequent attempts should be from a final turn height and position appropriate for the conditions
- ensure that if the final turn is completed to one side of the intended approach path, that any further manoeuvring is completed accurately and early on in the approach
- introduce a lower final turn but at the normal position to check that the trainee doesn't use the airbrakes until the glider has intercepted the airbrake approach path. This will pick up any 'landing lever syndrome', and show if the trainee knows what a 2/3 airbrake approach looks like in the prevailing conditions.

DE-BRIEFING

- accuracy of speed control
- straightness of approach and early corrections
- judging the apparent movement of the RP
- achievement of approach path to the RP
- recognition of the achieved descent path (shallow or steep) compared with the airbrake ideal
- wind gradient effects on attitude and airspeed.

ADVICE TO INSTRUCTORS

To save time in the air you can agree on an RP before take-off and hope no one shifts it before landing.

> If a trainee has not been shown an undershoot, or cannot recognise when one is about to occur, then he is not safe to be sent solo.

The demonstration is more effective in light winds and if the approach is long. Plan the circuit accordingly, with a final turn at 500' to 700'. To show the RP movement when the glider is undershooting,choose an RP well into the field so that the trainee can recognise what's happening - which might take a surprisingly long time. If you land short it won't matter, and will be a lot more useful than demonstrating how easy/difficult it is to pass through a boundary hedge!

Movement of the RP does not indicate whether the approach is high or low. Judge height by reference to the apparent size of objects, e.g. trees, hangars etc.

If there is a marked wind gradient, or turbulence, the trainee may have difficulty distinguishing between what you are attempting to demonstrate and RP movement due to other causes, such as necessary changes in attitude to maintain airspeed.

Occasionally you won't be able to demonstrate the undershoot, overshoot, and the normal approach, in one flight, or even use the same RP in a single flight. Don't be tempted to cheat. Either choose a new RP somewhere else on the field, or do another flight to complete the demonstration.

Maintaining a constant speed throughout the approach requires good coordination between airbrake and elevator. Reasonable skill is required before a trainee attempts to judge and control the approach. If the workload is too great then prompts may be required for such things as the airbrake settings, and the resulting attitude changes needed to maintain the speed. In principle the full range of approach angles from no brake to full brake is available (figure 3, facing page).

In the no airbrake approach case the only safety margin there is - as far as landing on the field is concerned - derives from the position of the RP in relation to the downwind boundary of the landing area (ie., the further upwind the better) and any excess speed which the glider may have.

The full airbrake approach angle can be improved upon by diving to take advantage of the fact that drag is proportional to the airspeed squared. This should be considered as an emergency action only and never ever used as the normal approach technique.

Powerful airbrakes can mask poor elevator coordination, especially when the nose is lowered too far. If the glider is already above the approach funnel this can lead to the elevator and airbrake functions being 'swapped round', i.e. using the

airbrakes to control the speed and the elevator to control the approach angle. In other words, using the RP as an aiming point - like a dartboard! This style of approach may only become evident, critically so, when converting to a glider with less-powerful airbrakes. The clues are full airbrake, steady RP position, and the speed either increasing or above the chosen approach speed.

In very turbulent conditions the use of large amounts of airbrake improves the lateral stability but can sometimes increase pitch sensitivity. During a trainee's first few attempts at using the airbrakes, it is as well to suggest that he doesn't alter the airbrake settings during the last part of the approach and until after touch-down, even if the glider is slightly undershooting or over-shooting the RP. You may need to prompt to stop him adjusting the airbrakes and to give his full attention to the round-out.

When approaching through a wind gradient a more nose down attitude is needed to maintain a constant airspeed than if the wind remained constant. If the airspeed is getting low, be prepared to take control of the glider and close the airbrakes; there may be insufficient time to prompt. Complete the landing yourself. Maintain the speed all the way down to the round-out. In a very strong wind gradient this may not be possible (at hill sites, for example) because you would have to finish the approach in a steep and possibly VERY steep dive. Under these circumstances allow for some inevitable decay in the speed by beginning the approach at a higher speed than usual.

Note. There is often subtle confusion among instructors, and inevitably amongst their trainees, as to the exact meaning of 'half airbrake'. Is it half of the airbrake paddle visible above the wing, or is it half of the air brakes' full effect? The difference is important. 'Half visible' and 'half full effect' aren't usually the same, and vary with glider type. In general, teach 'half airbrake' to mean half its full effect.

COMMON DIFFICULTIES

Adjusts the airbrakes too frequently. Any tendency to do this should be discouraged, especially if the effect of one change can't be detected before the next is made. Failure to maintain a near-constant setting may be due to lack of familiarity with the forces and changes involved. A useful exercise to help overcome this problem is to agree before take-off that the trainee may move the airbrake position once only on the approach. In practice you may have to allow more, but the exercise will discourage frequent adjustments and help to build confidence.

The practice of **closing airbrakes in the final stages of the approach** should be discouraged unless:

- the speed is decaying too quickly to allow a safe completion of the round-out, and the glider is too close to the ground for the pilot to be able to lower the nose
- lowering the nose isn't increasing the speed fast enough. Ka7 trained pilots can develop this habit because full airbrake is so powerful that the speed loss at the round-out is very rapid.

Power pilots converting to gliding are prone to ease in the airbrakes gradually.

Small amounts of airbrake often lead to PIOs during the float when the speed doesn't decay soon enough, or as expected.

For some reason, approaches seem to get shallower especially when the trainee wants to land short. It is important to note (see figure 6) that an accurate normal 2/3 airbrake approach leads to a nice short landing, not the shallow one.

Landings are easier when made with 2/3 airbrake. During the round-out and float the speed's rate of decay is comparable with a comfortable rate of elevator movement.

Frequent need to close the airbrakes in the final stages of the approach may indicate poor airbrake/elevator co-ordination or an inadequate allowance for wind gradient effects. It may also be a sign of poor judgement of the round-out point: specifically, a lack of confidence in the ability to judge the height at which the round-out should begin, resulting in one that is too early and too gradual.

Opens airbrakes on approach when they aren't needed. This can be the 'going into land lever' syndrome, which often occurs just after the final turn. The brakes may be opened fully, and then partially closed - usually before the trainee has had any chance to work out whether he is under or overshooting. It may also signal the start of the 'adjusts the airbrakes too frequently' problem mentioned earlier.

REMEDIAL EXERCISES

The following two exercises are designed to show the importance of maintaining a steady airspeed during the approach, and what can happen if you don't. These exercises are not normally to be shown to the trainee unless, after all other demonstrations, it is felt that he doesn't understand the need for steady speed.

Exercise one. The overshoot

- tell the trainee that you will fly the approach and landing
- as you pass abeam the landing area, agree an RP close to the downwind boundary of the landing area
- the trainee should follow through on the controls, including the airbrakes
- to give sufficient time for the demonstration, make the final turn higher than normal, between 500 and 700',
- after completing the final turn at the correct airspeed, open the airbrakes at the correct time, but use 1/4 instead of 2/3
- as the glider begins to overshoot lower the nose to keep the RP in the correct position on the canopy (figure 4, fracing page). Don't alter the airbrake setting
- emphasise that the RP still looks in the right place in relation to the canopy, but that you are *failing to monitor the airspeed*

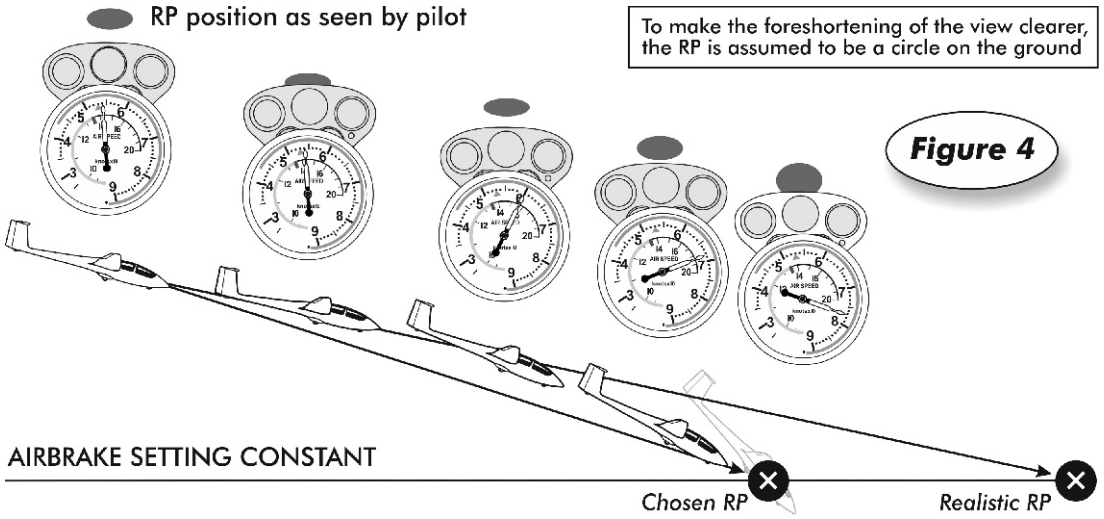

Figure 4

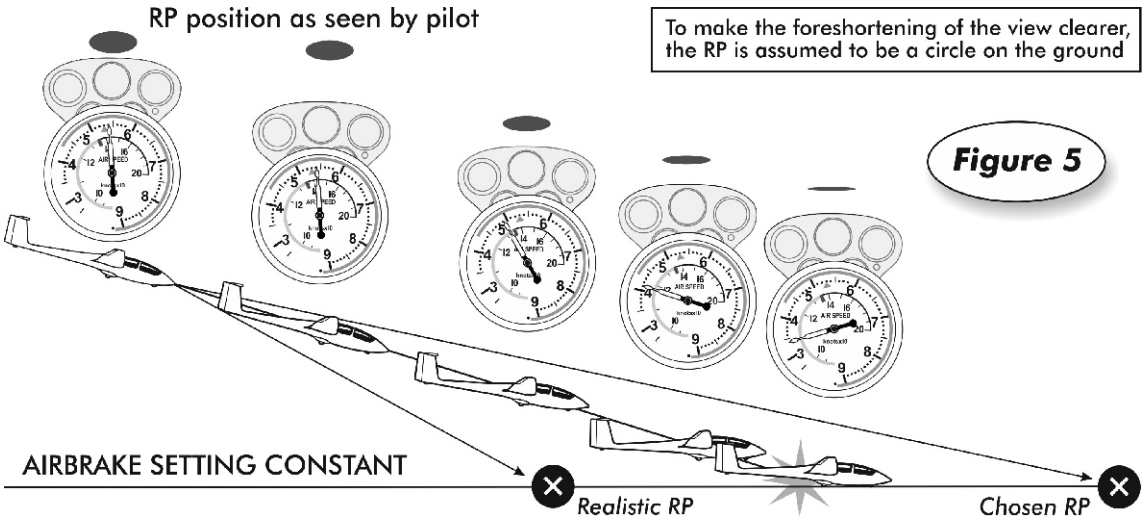

Figure 5

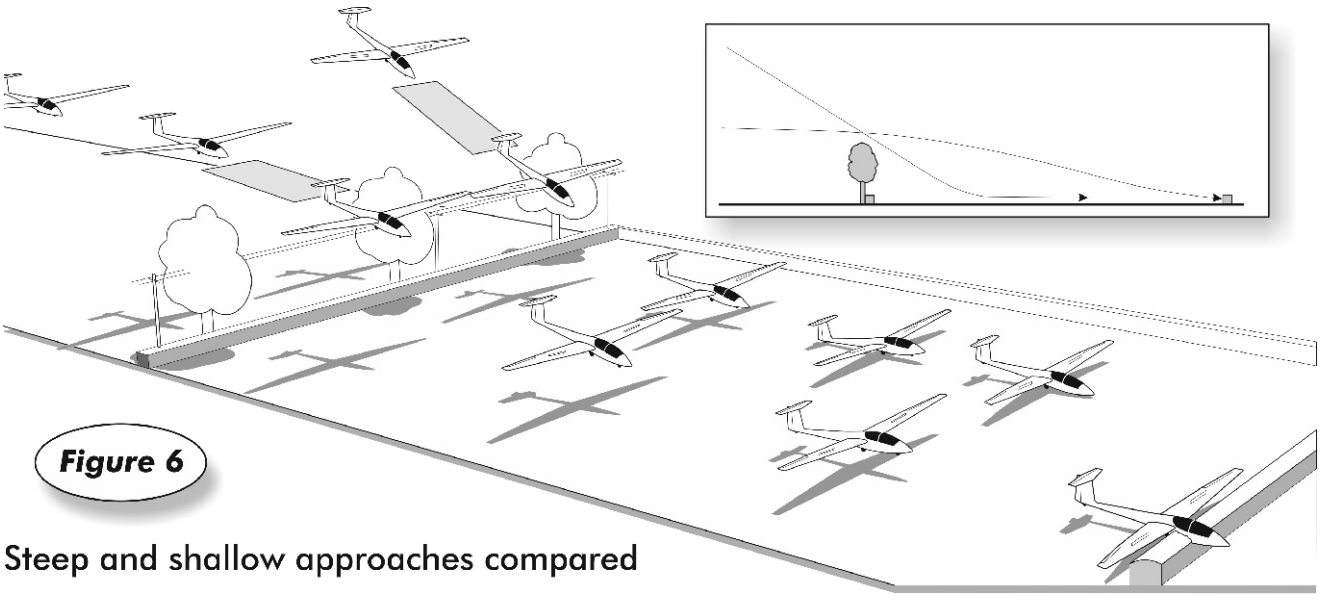

Figure 6

Steep and shallow approaches compared

- the airspeed will increase slowly at first. After it has increased by about 15kt or so, 'realise' that the speed is high and slow down to the correct approach speed
- comment that the overshoot was only apparent when you 'noticed' that the airspeed was increasing, and you then slowed to the correct speed. Up until that moment the RP picture looked OK.

Exercise two. The undershoot

- set everything up, as in the previous exercise, but make sure that the RP is well into the field, with a safely large undershoot (you will inevitably land short of the RP)
- use a slightly higher approach speed. If it is a 50kt approach day, use 55kt
- at the appropriate time set up an undershoot by using full airbrakes rather than ½ to 2/3
- as the glider undershoots and the RP moves up the canopy, raise the nose to put the RP back in the correct position. Maintain full airbrake (figure 5, below)
- comment that the RP picture looks OK, but emphasise that you are *failing to monitor the airspeed*
- the airspeed will slowly decrease. After losing 5kt to 7kt, 'realise' that the airspeed is falling. If you are at a safe height (200'-300') and over a safe landing area, lower the nose to retrieve the speed you've lost. With the airbrakes still open, deliberately land short of your chosen RP. You won't have much choice in this matter
- point out that the undershoot only became apparent when you realised that the airspeed was falling. Up until then the RP picture had looked good.

***WARNING*. Don't allow the glider to get low and slow in this exercise. Stalling on the approach, crashing in the undershoot or smacking into the downwind hedge is not a demonstration of anything positive, not even of what not to do. If you mistime the exercise, discontinue it immediately. Close the brakes and accelerate. Set sensible minima.**

NOTE. Both these exercises demonstrate that the RP technique doesn't work if the attitude and speed are changing.

