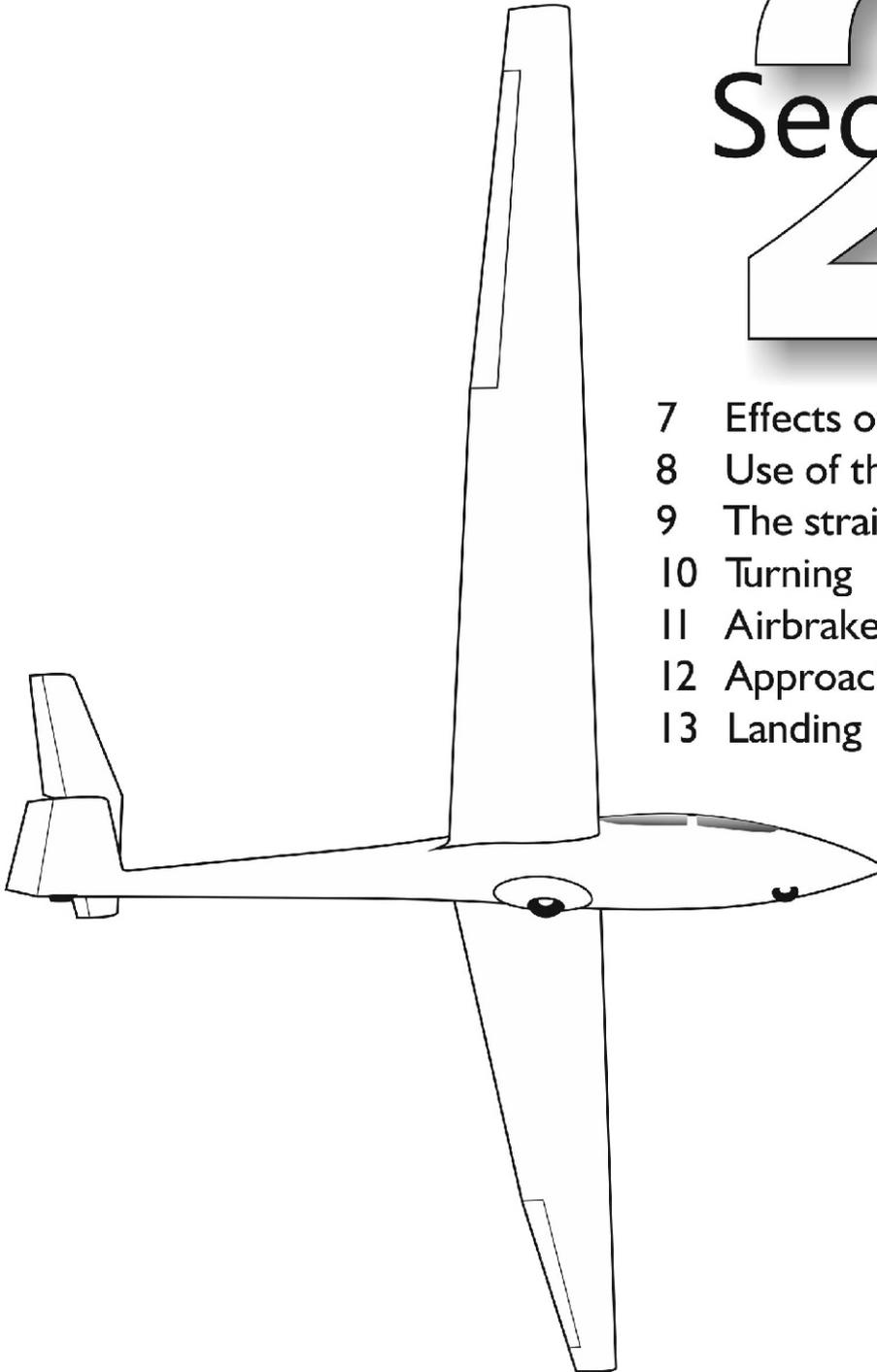
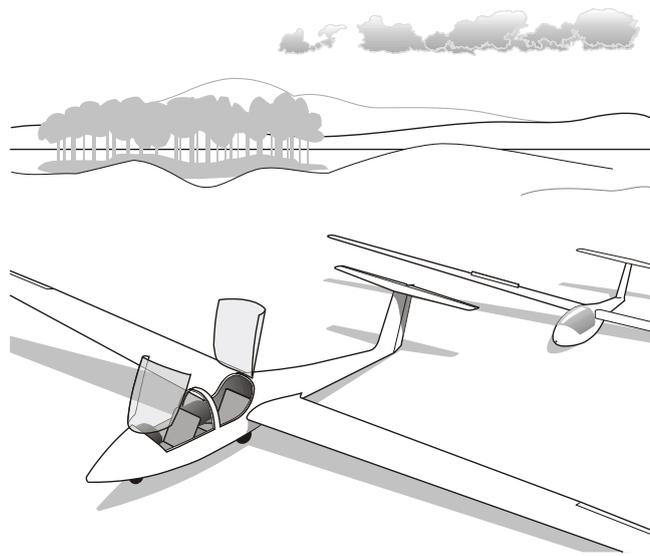


Section 2

- 7 Effects of controls
- 8 Use of the trimmer
- 9 The straight glide
- 10 Turning
- 11 Airbrakes and spoilers
- 12 Approach control
- 13 Landing





7 - EFFECTS OF CONTROLS

The purpose of these exercises is to give the new trainee an understanding of the three types of control, their relation to the glider's axes, and their effects. Brief the trainee on the names, functions, and locations of the control surfaces, and how they are operated from the cockpit.

An appreciation of the actual stick forces and the speed of the control responses can only be gained from hands-on experience. Nevertheless, it is prudent to mention that the elevator is usually the most responsive and sensitive of the controls, and that the forces of the other controls vary with speed and glider type.

INSTRUCTING CONSIDERATIONS

As an instructor it is important that you understand the following teaching points and some of their implications:

Trainee 'follow through'

- the trainee should use the right hand with the stick held in a light grip between thumb and fingers (left-handers have to conform to this, given that most gliders are laid out for right-handed people)
- in following through, the trainee learns how far to move the control, at what rate, and in what direction, but NOT the forces involved.

Don't allow trainees to follow through if you are demonstrating exercises like stalling or spinning [chapters 18 and 19] for the first, or possibly the first few times.

You have control/I have control

The importance of the words *You have control/I have control* cannot be over-emphasised. Right from the start of their training it is vital that trainees establish the habit of letting go of the controls when asked to do so.

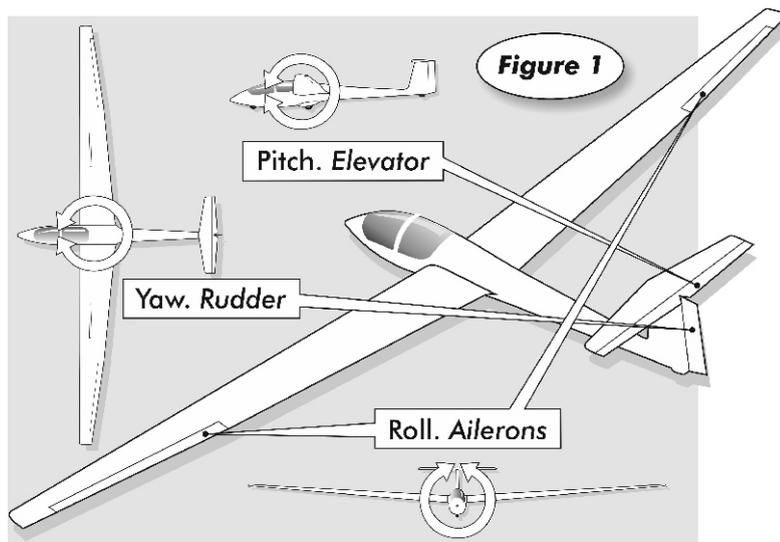
When you use the words *You have control*, the trainee should answer *I have control* (exactly those words). When you know they have control, take your hands and feet off, unless you have specified something else, e.g. *You use the ailerons while I coordinate with the rudder*. Similarly, when you say *I have control*, make sure the trainee replies *You have control*, and then lets go. In those rare cases where the trainee seems determined to hang on regardless, an established form of words and the related automatic actions can get the message through where other methods have no effect.

Who is really doing the flying?

Do you remember how irritating and sometimes confusing it was to be with instructors who kept fiddling with the controls when you were supposed to be doing the flying? What did you learn from them except who not to fly with next time, if you had any choice? Once solo, and until you became a Basic Instructor, you have done all of the flying. You may not now find it easy to let someone else do 'your job', particularly if they seem to have little control over where they go, and how they get there.

Interfering with the controls either covertly or overtly when the trainee has been told *You have control* is, at best, a waste of their

time and money, and at worst, downright dangerous. They will gain the wrong impression of the amount of pressure that needs to be applied to the controls, and/or a completely false idea of what the glider does in certain circumstances. Years later, when you are not around to help, your previous 'assistance' could kill them. If you find you have a tendency to interfere with the controls, fold your arms. However, there are quite a few occasions when it isn't a good idea to keep your hands too far away from the controls; during your trainee's first attempts at the approach and landing would be one example.



Clear demonstrations

While you don't want to upset your trainee, most of the demonstrations in this chapter shouldn't be done too gently. Many trainees' idea of a *light grip on the controls* is either so light that they usually let go of the stick the moment it moves, or occasionally so rigid that you find it difficult to move the stick at all. Either way, if you demonstrate something using tiny movements of the controls, your trainee may not make any connection between what you did (or said you did) and the glider's response.

It is easy to obscure the effect you are trying to demonstrate by inadvertently adding others, particularly if the air is at all rough. Within reason, a clear demonstration should include only those items and actions which you have said you will be demonstrating, and they need to be obvious.

If the above remarks seem a bit pointless, fly with an established instructor as his 'trainee'. Ask him to demonstrate the use of the elevator, first very gently, and then less so. Follow through and note how easy it is, or not, to detect the control movement involved. If you were an inexperienced trainee and didn't know what to expect, could you tell what was happening, and why? If the air was at all rough, would you know which jiggle of the stick was the one which lowered the nose?

Keeping in range

As obvious as it may sound, it takes no great skill to fly out of range of the airfield while demonstrating something, or monitoring trainee practice. You probably did this when practising for the Basic Instructor rating. Stay within gliding

range, and organise demonstrations and trainee practice so that, as height is lost, you manoeuvre progressively back towards the airfield.

BRIEFING POINTS

Elevator

The elevator is the most sensitive of the controls. With the glider in the normal attitude, draw the trainee's attention to the look of the normal attitude. In order to feel the movements of the controls and relate it to the results, the trainee needs to follow through on the stick while looking out over the nose.

Before asking a trainee to follow through, check that he is not sensitive to reduced G. You may have found this out already by their reactions on the launch, but if not, do the first demonstration of the elevator with the trainee's hands and feet OFF the controls.

Following this preliminary check, get the trainee to put his **right** hand on the stick. Gliders are laid out for right-handed people, so left-handers may find these early stages more difficult.

Begin the demonstration with the glider in the normal attitude, and move the stick forward far enough to increase the speed by about 10kt. Point out that the glider is in a new attitude and that the airspeed has increased. Return to the normal attitude, pointing out that it is the normal attitude, and that the speed has returned to its previous value.

Now demonstrate a very gentle stall, making the point that though moving the stick back more can make the nose rise further, this isn't always so. The point you are trying to make is that if you move the stick back and the nose fails to rise, or goes down instead, the stick must be moved forward to lower the nose and regain flying speed. The instinctive reaction would be to pull back even further, so it is vitally important to show the trainee, even at this very early stage, that in some circumstances you can move the stick back and either nothing happens, or you get exactly the opposite of what you expected.

It is equally important that the trainee understands why this is so. Many people have heard of stalls, often through inaccurate and sensationalised reports in the press, and are relieved to experience one without the major disaster they were anticipating. To avoid disconcerting the trainee, but also to make the point, the stall should be neither too pronounced, nor barely perceptible.

Return the glider to the normal attitude and remind the trainee that it is the normal attitude.

Demonstrate several gentle stalls first to familiarise the trainee with the sensations. Unless he seems overanxious, let him have a go. Encourage him to respond to *You have control* with *I have control* as he takes-over. Ensure that he stalls and recovers. Don't allow him to do more than a gentle stall.

Ailerons

Show the trainee the normal picture with the wings level. Point out that it is possible to detect whether the wings are level or not without having to look down each wing, simply by looking ahead and noting whether the cockpit edge is symmetrical with the horizon. Demonstrate this by banking the glider both left and right. Ask the trainee to follow through on the stick - at this stage he won't be using the rudder.

Stress that before turning he must look out [chapter 5]. The lookout must be thorough. First look away from the proposed direction of turn, then as far round in the intended direction as possible. Emphasise how important it is that he tells you if he sees any other aircraft. Having made sure it is clear in the direction of the turn, the trainee should then look back over the nose. If he is reluctant to do so, his 'into turn' lookout may have been inadequate.

Move the stick to the left or right. Aim to achieve a positive angle of bank of about 30°, at a readily observable rate of roll. Be ready to compromise if the trainee seems unduly nervous.

Unlike the elevator, where the stick can - up to a point - be moved and held in a position without the glider's attitude continuing to change, here the aircraft will continue to roll until the stick is centralised - normally slightly beyond the ailerons neutral position -, at which point the glider stops rolling, adopts the new bank angle, and then starts to turn. Using a positive angle of bank will ensure the trainee needs a slight backward pressure to the stick to stop the nose from going down. This introduces the need for coordinated use of the elevator with the ailerons.

Now demonstrate how to return the glider to wings level. Lookout first, then show that when the wings have been levelled after coming out of a turn, the back pressure on the stick has to be removed. Again, point out the advantages of using attitude as a reference. Let the trainee use the ailerons, turning two or three times each way, while you operate the rudder to maintain balanced flight.

It's important that the trainee appreciates and understands that the glider will roll, and continue to do so, if the ailerons aren't neutral, i.e. stick not central. Allow limited practice at rolling into a turn, centralising the stick to maintain the bank, then rolling out and centralising the stick to keep the wings level.

The rudder does not turn the glider

It's vital to clear the trainee's mind of the admirably common sense notion that the rudder turns the glider in the same way that a rudder turns a boat. The only time when this is even part-way true is during the ground run, where banking to steer the glider round corners isn't very sensible.

Ask your trainee to follow through with their feet on the rudder pedals, but with hands off the stick. This helps to avoid any confusion since at some point in the demonstration you will have to use the other controls to prevent the glider gradually rolling and diving. Pick out a suitable into-wind line feature on the ground. Fly along it and apply a large amount of rudder one way or the other. Tell the trainee which pedal you have pressed, and point out the direction in which the nose swings. Keep the wings of the glider level using the ailerons so that the glider's track remains along the chosen feature. Draw attention to the fact that the glider is flying sideways -

- *Notice the string-*

- and not travelling in the direction it is pointing. This may not be immediately obvious to the trainee.

Now centralise the rudder and allow the nose to swing back to the original heading. This shows the trainee that the rudder yaws the glider, but does not turn it. This is a demonstration exercise only and it isn't necessary for the trainee to try it; he will probably be doing it inadvertently anyway.

Adverse yaw and coordination

Demonstrating adverse yaw shows the trainee the secondary effect of the ailerons, and why we need to use the rudder at all. Have the trainee follow through on the stick and rudder - his feet should be on the rudder pedals so that he can feel that you aren't cheating by moving them.

- *I am going to use the ailerons without using any rudder*
- *Have a good lookout, particularly in the direction of stick movement*
- *Look over the nose.*

If the trainee doesn't look over the nose he won't see what you are demonstrating.

- *Look what happens when I move the stick to the left without using any rudder*
- *Which way did the nose move? I wanted to go to the left/right, but what happened first?*

Your trainee may be surprised, even puzzled, that the nose of the glider swung the wrong way initially. Most trainees will need and benefit from a second demonstration. Tell them what the effect is called and, briefly, why it occurs. Get them to follow through as you demonstrate how coordinated use of the ailerons and rudder overcomes adverse yaw. To avoid confusion, demonstrate the effect and how to avoid it, in the same direction eg, each time to the left.

Reinforce coordinated use of the rudder by making two or three turns and reversals without altering the heading by more than 20° or 30°. Rolling from one side to the other whilst staying on a heading is also a good demonstration, as the results of poor coordination are very obvious.

Hand over control to your trainee and ask him to try two or three turns and reversals, or 'rolling on a heading'. The exact amount of rudder for accurate coordination is largely a matter of practice. Reference to the yaw string helps, though this is something else which the trainee may fixate on and forget everything else. Give guidance on the approximate amount of rudder required, perhaps saying,

- *Use a similar pressure on each control.*

The advice will depend to some extent on the relative forces and general harmonisation of the aircraft's controls, which vary from type to type and even, occasionally, between aircraft of the same type.

THE ASI AND SPEED MONITORING

The trainee should learn to monitor the airspeed indicator and, as soon as possible, be required to fly within specified airspeed limits. You need to be careful here. Their use of the ASI mustn't be to the detriment of lookout, nor to the practice of flying by attitude. Help them strike the correct balance. The exercise that follows can be left until later if the trainee seems unable to cope due to, say, turbulence. A demonstration isn't appropriate, so the trainee should fly the exercise.

Hand over control and ask him to fly the glider in the normal attitude and note the ASI reading. Ask the trainee to read off the airspeed aloud so that you can check he is looking at the correct instrument. Ask him to *fly at 60kt* (eg), and to lower the nose to the position which he estimates will result in 60kt. After a short while - to allow the glider to accelerate - ask the trainee to check the ASI to see if he has succeeded in finding the correct

attitude/airspeed combination. If it's not very close to what you asked for, ask him to adjust the attitude and try again.

Emphasise the importance of attitude (and lookout) to avoid the trainee becoming fixated on the ASI, then continue with the next demonstration.

'Chasing' the ASI, and the importance of attitude

Ask the trainee if he noticed how long it took the glider to reach the requested speed. Then, from the 'normal attitude', take control and move the stick smoothly but not too slowly forward until the ASI reads, say, 50kt (or some value between 10kt and 20kt above the glider's 'normal' speed). Hold the stick in that position. The speed will eventually go beyond 50kt. Talk through the demonstration so that the trainee understands why this is happening, and draw his attention to the time it took for the glider to accelerate.

Now smoothly raise the nose until 50kt is again indicated. Hold whatever attitude the glider happens to be in at that point. (Don't pull up too quickly as the glider will be well nose up by the time the speed has fallen to 50kt, and the only way you'll then avoid a fairly vigorous stall is to make a recovery under reduced G). The speed will bleed off to well below 50kt. Move the stick forward again to prevent the glider stalling.

Emphasise that the only way to control the glider is by setting the attitude and waiting for the speed to stabilise. If it doesn't stabilise at the required speed, re-adjust the attitude. Hand back control to the trainee so that he can practice attitude/speed control.

ADVICE TO INSTRUCTORS

Remember the framework within which we should be teaching:

[1] Pre-flight briefing

In formal flying training this would be a long briefing in the classroom and a short briefing just prior to the flight.

[2] Air exercise

This consists of a demonstration, followed by the trainee's attempts and your correction of any faults. There may be a need for a re-demonstration.

[3] De-briefing

De-brief immediately after landing.

During demonstrations, tell your trainee what you are going to do **before** you do it. For example, *When I move the stick forward, the nose of the glider will go down*, then move the stick forward. This arms the trainee against the unexpected, and the glider's response reinforces what you have just said [chapter 1].

Trainee's attempts and prompting

For the first attempt or two it may be necessary to give the whole of the patter. Generally, prompting should be the minimum necessary to encourage sufficient movement of the controls and the required change of attitude. Prompts such as *Lower the nose - that's enough*, should be sufficient if the briefing and demonstration have been understood. Be conscious of the right amount of control movement in terms of *too little, too much* and *just right*. 'Just right' is a matter of personal preference; some pilots are much more positive than others in their use of the controls.

COORDINATION OF THE CONTROLS

The trainee should not be allowed to operate any single control on its own longer than is necessary to get a feel for it. The aim is to teach coordinated use of all three controls.

To help the trainee adjust to the increasing workload, full coordination can be approached in three simple stages:

Stage one

The trainee uses the stick (elevator and aileron together) with the instructor operating the rudder. If the trainee fails to notice changes in pitch or in roll, then prompt. Your aim is to get him to monitor both. Do not allow any more practice than is necessary to gain a basic skill.

Stage two

If the glider is banked by 30° or so (the instructor again operating the rudder) the need for elevator coordination will be

apparent to the trainee. The aim is to have the trainee roll the glider into the turn, and keep a constant angle of bank without the speed increasing. Once this skill has been acquired, introduce the use and coordination of the rudder.

Stage three

Aileron and rudder coordination is dealt with in the patten notes at the end of this manual. The demonstration and practice consist of gentle turn reversals within 30° of a heading. If the trainee has good aileron (bank) and elevator (pitch) coordination, there should be no significant speed changes during the exercise. Again, rolling on a heading helps to improve the trainee's coordination.

For the turning exercise, the rate of roll and the angle of bank should be typical of those used for entering and circling in a thermal. A positive turn entry makes it easier for the instructor to detect any lack of coordination between rudder and aileron, and a well-banked turn will highlight any problems the trainee has in coordinating the elevator with bank angle.

COMMON DIFFICULTIES

Under-confident or nervous trainees may use the controls tentatively. Encourage them to be more positive.

Confident, assertive or impatient trainees may tend to over-control. Encourage smoother inputs.

Over-controlling can be lessened by encouraging trainees to fly with their forearm resting lightly on their thighs. Stick movement can then be made using wrist and/or forearm movements. Using the entire arm can lead to coarse and jerky movements. In this respect it's important that their seating position is correct before they take-off.

Trainees who are nervous of banking can be allowed to turn or bank gently to start with, but should be encouraged to bank properly (30°) as soon as possible.

Trainees' frequently work against themselves by pushing with one foot and forgetting to relax the other. A common, though not infallible clue, is if the trainee, when asked about the rudder forces in an aircraft where you know them to be light, responds that they seem very heavy. If you look down at your set of rudder pedals, you may see both of them move forward a small amount the moment the trainee starts to put on rudder. Asking trainees to relax in such circumstances is like asking them to be spontaneous, but it sometimes works.

Some trainees have difficulty understanding the difference between movement through the air (heading) and apparent movement over the ground (track), they'll often

make things 'look right' by flying sideways. In crosswind conditions this can lead to over-ruddered turns, and the risk of spinning in off the final turn, so the differences are important. A formal discussion or briefing will be needed. In the early stages of training, set up air exercises to avoid the spurious sideways flight created by flying across wind.

Gliders are built with the controls laid out for right-handed people. Left-handers will have to fly with their right hands and may either over-control initially or make inappropriate control inputs.

Hang-glider or weight-shift micro-light pilots who take up gliding come to it with a built in set of control responses which are exactly the opposite of those needed to fly a conventional aircraft. To turn left, for example, a hang-glider pilot swings the control bar to the right, and to dive they ease it back. Given these habitual responses, it can appear, wrongly, that they are sensitive to reduced G. As long as thinking time is available, the original responses are easily overcome. Nevertheless, in relation to conventional aircraft, the 'wrong responses' were learnt first, and in an emergency, such as a cable-break, or any other occasion when the workload is unusually high (the round-out is a particular favourite), those will be the ones likely to dominate. There is no question of a straight conversion here, as there would be in converting a power pilot to gliding. The only way to replace the initially learned responses is by rigorous re-training and testing, which is why this item appears here and not in Type Conversions [chapter 22].