

8 - TURNING

INTRODUCTION

The table below indicates the aspects of turning specified for SPL Training:

Exercise 8: Turning	
(i)	Lookout procedures
(ii)	Demonstration & correction of adverse yaw
(iii)	Entry to turn (medium turns)
(iv)	Stabilised turns
(v)	Exiting turns
(vi)	Faults in the turn (slipping, skidding & speed control)
(vii)	Maintaining appropriate look-out procedures
(viii)	Turns on to selected headings and use of compass
(ix)	Use of instruments (ball indicator or slip string) for precision

Turning is in section 4.2 of the BGA Student Pilot Manual

Turning skills are fundamental to safety and soaring progress. Do not skimp on this training!

The ability to roll the glider quickly and efficiently into well-controlled turns is fundamental to basic flying confidence. Since gliders spend much of their time in circling flight, failure to develop turning skills inhibits the development of a successful soaring pilot. In addition, stalling and spinning accidents are often associated with poorly coordinated turns.

Analysing And Correcting Turning Difficulties

Turning requires considerable skill in coordinating all three controls together, and comes from repeated practice, combined with the ability to recognise mistakes, their causes, and what to do about them. The instructor's job is not only to teach well-coordinated turning, but also how a student can criticise their own flying for continuous improvement. Post-solo development requires that pilots have already learnt from their instructors how to recognise turning inaccuracies, and how to correct them.

Neither you nor the student will recognise a poorly coordinated turn entry unless looking over the glider's nose as it enters the turn. The view over the nose provides continuous information about;

- the attitude, and therefore the speed
- the direction and rate of yaw
- the direction and rate of roll
- the bank angle
- any slip or skid

Much can be learned about the quality of a turn from the way it feels. However, careful observation of the aircraft and its controls are required to identify what needs to be done to

correct errors. Reference to 'Common Difficulties' at the end of this chapter should prove helpful.

Student Practice

The weather conditions (turbulence and/or convection) influence the value of the student practice. If the air is smooth there is little value in prolonged turns.

Turning practice whilst soaring is of tremendous value, not only providing extra time on the controls, but fun. It is an opportunity to emphasise the reasons for accurate speed control and coordination (See also chapter 14 – Advanced Turning). The student also gains considerable satisfaction and confidence from having made the glider climb.

THEORY BRIEFING

The glider is turned by rolling it so that some of the lift force created by the wings produces the required 'pull' (acceleration) in the direction of the desired turn. Because this 'tilt' reduces the vertical component of lift supporting the glider's weight, an appropriate back pressure is needed on the stick to increase the AoA to make up the difference. This increases both the into-turn component and prevents the nose from dropping.

- before entering a turn look out and check that the airspace you'll be entering is clear, and will remain so
- while entering the turn, look over the nose of the glider to check the attitude, the roll rate, the angle of bank, and any yaw
- the rate of roll is determined by the amount of aileron applied. The larger the stick deflection, the faster the roll rate and the more rudder is required
- the rudder overcomes the adverse yaw (aileron drag) created by the ailerons when they are deflected
- the rudder is applied in the direction of the roll. The amount applied is;
 - proportional to the aileron input
 - more at low speed, less at high speed
 - much smaller when the desired angle of bank has been reached, and the ailerons 'centralised'
- the greater the bank angle, the faster the rate of turn
- during a turn the natural tendency is for the glider's nose to go down. If no action is taken both the rate of descent and the airspeed will increase
- the ailerons are used to stop the roll continuing once the desired bank angle has been reached, and the rudder is reduced to keep the turn coordinated.
- once the roll into the turn is complete, look out again. Set up a visual scan – Lookout, Attitude, Instruments. Look out for other traffic, then over the nose to check the attitude, the angle of bank and the yaw string, then the instruments – include height to get back to the airfield and speed. Perhaps if climbing, location of controlled airspace.
- rolling out of the turn is the reverse of rolling in

- look out to ensure it is clear – especially under the upper wing
- look back over the nose
- apply coordinated aileron and rudder

As the wings come level, centralise the ailerons and rudder and maintain the attitude by reducing the back pressure on the stick.

AIR EXERCISE BRIEFINGS

Conduct the Air Exercise & by the Glider Briefings as described in chapter 3, ensuring that the student is ready to get the best from the Airborne Lesson. Students should be warned that it usually takes quite a while to achieve a good standard of Turning and longer to become 'fluent'.

There are a considerable number of exercises and manoeuvres within 'Turning' and they should generally not all be attempted in one flight. Brief sufficient of them for the flight intended and leave plenty of time to practice them until a reasonable grasp of them has been achieved before adding further exercises.

As always, before any of the flying exercises include Threat & Error Management, in this case along the lines of the example below.

TEM

Threats:

Collision

Mitigation:

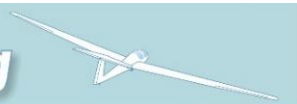
Maintain thorough
Lookout

Errors:

Running out of height
for appropriate circuit

Monitor height &
position

The Flying



'Patter' Notes for the exercises in this chapter are included in Section 3 Chapter G.

MANOEUVRE DEMONSTRATION

The student should follow through on the controls.

Going into the turn

- before turning to the right, (eg), look out, first to the left and then round as far as possible in the direction of the intended turn, particularly behind the wing [see Section 1 chapter f and Section 2 chapter 15a].
- if it is clear then:
 - look ahead over the nose
 - roll the glider using aileron and rudder together
 - as the bank increases, maintain the attitude with a slight backward pressure on the stick
 - when the desired bank angle has been reached, use the ailerons to prevent it increasing any further, and reduce the rudder deflection
 - the glider is now established in the turn
 - re-trim if the turn is going to continue.
- now, look out again.

Staying in the turn

- notice how the nose moves steadily around the horizon
- keep the bank constant, making any corrections with coordinated aileron and rudder
- continue to maintain a good lookout, particularly in the direction of the turn and along the horizon.

Coming out of the turn

- first check that it's clear to straighten up, especially behind and below the higher wing:
 - take off bank using coordinated aileron and rudder
 - relax the back pressure to maintain the attitude
 - when the wings are level, centralise the ailerons and rudder.
 - re-trim if necessary.

MANOEUVRE LESSON

Once the demonstration of the exercise is complete, it's time to teach it to the student. Consideration needs to be given to the order that each part of the turn is taught. What is the student already good at? Hopefully they can hold the correct attitude in straight flight and keep the wings level with aileron and rudder. Ask yourself which part of the turn is the most appropriate to teach first. In any case it is very important to split up the exercise into manageable chunks (very easy with the turn, as it's already split up into the three stages). We can then teach that 'chunk'. So let's say that 'staying in the turn' is the first chunk taught. We can demonstrate that part of the turn again, explaining how we are staying in the turn and then ask the student to take over and have a go at that bit of the exercise. How the exercise is split up is at the discretion of the instructor. Regaining a heading

This is a repeat of the straight glide exercise but includes a gentle turn to regain the original heading. Brief on the following:

- **regaining the heading** by choosing a feature to turn towards, using small angles of bank and coordinated controls
- **rolling the wings level** when the feature is ahead
- **continuing in straight flight**, using the scan cycle.

For student practice, take control, identify a distant ground feature or cloud ahead, and then introduce a heading error. Hand back control to the student and ask them to return to the previous heading. The need for anticipation when straightening up soon becomes apparent, but the degree will depend on how quickly the glider is rolled wings level. A prior briefing and brief demonstration will be appropriate.

When the student can reliably turn onto a heading, then a briefing on use of the compass and turning onto compass headings should be introduced.

Continuous turns

Practice in continuous turning prepares the student for thermalling, and brings out any difficulties they have in maintaining turns. **Re-trim during continuous turns.**

Slip and skid

The opportunity to point out when the glider is slipping or skidding in a turn is usually while the student is flying.

Slip

- notice that;
 - there is a feeling of sliding into the turn
 - the yaw string is deflected towards the outside of the turn
 - the slip ball is deflected into the turn
 - the nose is higher than normal

Correcting slip

- the glider is slipping towards the lower wing, and needs more into-turn rudder
- apply sufficient to straighten the yaw string and/or centre the slip ball
- the bank angle and, indirectly, the attitude, are almost certain to be affected so make the necessary adjustments to keep the bank and attitude constant
- the turn is now balanced and there is no feeling of slipping into the turn.

Skid

- notice that there is a feeling of skidding and sliding out of the turn
- the yaw string is deflected into the turn
- the slip ball is deflected out of the turn
- note that the nose is lower than normal - looks safe, but isn't

Correcting skid

- the glider is skidding towards the raised wing, and needs less into-turn rudder
- reduce the amount of rudder to straighten the yaw string and/or centre the slip ball
- keep the bank and attitude constant using the ailerons and elevator respectively
- the turn is now balanced and there is no feeling of skidding out of the turn.

Turn reversals

Turn reversals improve coordination and use little height. As well as the aileron/rudder coordination required, there is the smooth relaxation and re-application of backward pressure on the stick to keep a constant speed.

Climbing turns

These are begun from a typical inter-thermal speed, say 70kt for a glass ship. Look out, and then pull up to an appropriate climb angle. As the speed reduces through about 55kt, lower the nose into the appropriate attitude for a normal thermal turn at the same time as rolling on the bank. Stress;

- the importance of lookout, not merely in the direction of the turn, but upwards. From 70kt the glider will gain considerable height on the pull-up, so it is particularly important to look well ahead and above before entering the thermal
- since the airspeed is changing, the aim should be to set the glider's attitude correctly in the turn, and then wait for the speed to settle. Check the ASI.

DE-BRIEFING

The debriefing should cover the lookout sequence, the roll rate, the angle of bank and coordination of the controls. The consistency with which exercises within Turning can be repeated indicate how ready the student is to move on to more advanced Turning (Ex14) and ultimately other skills. Be constructive but point out that while he/she may well have achieved a sufficient standard to move on to other exercises, becoming fluent at Turning takes a great deal of practice. Point out what should be included in their next flight, indicate that in their logbook, and as always, end on a high.

COMMON DIFFICULTIES

Failure to lookout before rolling into the turn is extremely dangerous. Emphasise the importance of lookout by taking control immediately and preventing the turn.

Looking out as soon as the glider starts to roll is common, and often results in poor coordination and speed control. Lookout is completed before rolling into the turn and checked again once the turn is established. The glider doesn't change direction until it is banked, and this only takes a few seconds.

Failure to look out before rolling out of the turn is no less dangerous than failing to look out before rolling in. Same remedy as before.

Very slow rates of roll and/or under-banked turns - can be achieved smoothly and with apparent accuracy even if the pilot's coordination is poor.. Don't sign off the student as competent at coordinating turns until they can roll promptly into a reasonably banked turn.

Bank varying in the turn. In straight flight students have difficulty recognising when the wings aren't level, and while turning can find it difficult to perceive small changes in the bank angle, which may be partly or wholly the problem. Bank can also vary if the student is over-controlling (Common Difficulties, chapter 7 contains advice on how to deal with over-controlling), or, due to high workload, their attention has been 'eye-trapped' by the instruments; usually the ASI or the variometer.

Bank increases in the turn. During a turn the outer wing traces out a larger diameter circle than the inner wing, so its airspeed is greater and it produces more lift. For this reason the ailerons almost always need to be slightly 'out of turn' to prevent the bank increasing ('holding off bank').

Bank reducing in the turn - may be due to holding off the bank too much, or a thermal core lifting the inner wing. In either case it is necessary to recognise what's happening, and then take action to prevent it. As the bank reduces, students may attempt to maintain a steady turn rate by ruddering the glider round. Allowing the bank to reduce, and over-ruddering can sometimes be a result of nervousness about steeper turns - look for the student leaning out of the turn.

Over-active yaw string. Before assuming 'guessing with the rudder', try flying the glider yourself. The location of the yaw string on some canopies can make it incredibly over-sensitive. If it is, try moving it to a less critical position. Learning to ignore the

yaw string is negative training, and may cause trouble later in a student's flying career.

Speed varying - is the result of poor elevator coordination and has several causes:

- the horizon not clear during part or all of the turn
- not appreciating the need to maintain the attitude when rolling into the turn, or when established in it
- not noticing the attitude change by failing to look over the nose during the roll into or out of the turn
- inadequate practice of the exercise
- failure to maintain the necessary back pressure on the stick when aileron input is required

- not re-trimming in a continuous turn
- chasing the ASI
- failure to monitor the speed sufficiently often, along with almost any of the other faults.

If the attitude remains constant the transition to stronger or weaker lift produces short term changes in speed. Explain to them why the speed changes and that maintaining a constant attitude is the key skill.

Speed and bank increasing in the turn is the start of a spiral dive. To recover, reduce the bank, bring the speed under control and then resume the turn. The initial cause of the problem may be over-banking, or a failure to coordinate.