10 - SPINS AND SPIRAL DIVES

SPL Syllabus: Exercise 10 Recognition & Avoidance of Spins & Spiral Dives			
(i)	**Safety checks**	**(vi)**	**Instructor induced distractions during the spin**
(ii)	**Stalling and recovery at the incipient spin stage (stall with un-commanded wing drop to about 45 deg and associated yaw)**	**(vii)**	**Recognition of spiral dives**
(iii)	**Recognition of entry into fully developed spins**	**(viii)**	**Spiral dive recovery**
(iv)	**Recognition of full spins**	**(ix)**	**Differentiation between spins and spiral dives.**
(v)	**Standard spin recovery**		
Note: Consideration of manoeuvre limitations and the need to refer to the sailplane manual and mass and balance calculations.			

INTRODUCTION

The exercises in this section should develop safe flying habits in all phases of flight, to avoid stalling and inadvertent spinning and to learn to safely practise spinning gliders. The trainee should be able to:

- recognise when spins can occur.
- avoid inadvertent spins by developing safe flying habits.
- recognise a spin's characteristics.
- learn and apply the correct recovery action with minimum loss of height.
- recognise the difference between the spin and spiral dive and apply the appropriate recovery action.

Many trainees and established pilots are apprehensive about spinning. However, inadvertent or accidental spins are very dangerous and have killed many pilots, but practice spins are very safe. From 1974 to date the same number of gliders have crashed practising spinning as gliders have been struck by lightning: two! As of 2020 the mortality rate from inadvertent spins is approximately one every 26 months. Whilst better than it has traditionally been, it is still far too high.

For the first demonstration the trainee should not have their hands and feet on the controls. A panicky trainee - who may never have experienced a spin before – may attempt to over-ride the instructor on the controls: when people are scared, they can become incredibly strong. Trainees should only be allowed to follow through on the controls when they are judged to be comfortable with the sensations and have shown no adverse reactions. Initially many trainees find spinning very disorientating, so do not include too many of these exercises in any one flight.

One thing that may help reassure nervous trainees is a discussion of minimum heights during the pre-flight briefing, including consideration of the likely height loss per-turn for the glider in use, etc.

Never demonstrate a spin below a height that does not allow for a comfortable safety margin. Apart from being potentially hazardous, your trainee will be concentrating more on the ground whirling round than listening to you! Nothing will be achieved by spinning excessively low. If spin training is undertaken before the trainee has had any experience of flying the glider at high speed, then the dive recovery itself can be alarming. For this reason, there is merit in teaching them to practice recovering from the dive, before undertaking any spinning exercises.

Most spin training will involve brief spin entries of about a half a turn, with the primary aim of recognising the circumstances in which they can occur and practising the correct recovery action. Continuous spins of two or three turns allow the trainee time to study the spin's characteristics, and distinguish it from a spiral dive, and to give confidence that the recovery action from a stabilised spin is effective.

When intending to demonstrate or practise spinning, it is important that the instructor takes the glider's particular characteristics into account; these have a bearing on the minimum heights for the various exercises. Some gliders spin fast and very nose down; some lose more height per turn; some start behaving differently after they have done more than a few turns. Make sure you understand, can explain and calculate an appropriate height for spinning exercises.

It is not true that a particular glider or type will not spin. It *is* true that some gliders are more reluctant to spin than others, but the 'unspinnable' one may have never been flown in conditions where it would. Remember that the thing we strive so hard to achieve for demonstration purposes is produced effortlessly by pilots who spin in without ever realising what they did.

However, most training gliders are docile. Sometimes both the instructor and trainee will attempt to spin, and fail, and the glider enters a spiral dive instead. Failed spin attempts are opportunities to recognise the ensuing spiral dive, and to practise recovering from it correctly. Recognising that the glider is not spinning is as important as recognising when it is. Applying full opposite rudder or maintaining in-spin rudder with the glider in a spiral dive can result in structural damage or failure. Be careful!

The trainee's understanding of why the glider spins and also their general confidence is enhanced by the ability to spin the glider successfully. If necessary, initially hand over to the trainee in the spin/spiral dive for them to recover on command. They should progress quickly to flying the whole exercise. Know your two-seater and do not attempt to use an inappropriate type that is excessively reluctant to spin.

Set up a realistic scenario, but do not go for the actual spin too quickly. Make sure the trainee is as hands-on as possible and encourage them to approach the stall themselves in various attitudes and bank angles. Compare each symptom to normal flight – sound, attitude, control position and loads, string position, buffet, possible wing drop etc. Point out that at this stage simply easing the stick forward will prevent a spin. Once you have demonstrated this, get the trainee to try it. (We are not spinning yet.)

Much of the lesson has now been carried out. The above is the most important bit. The actual spin is almost 'firefighting': '*If you have got to this point, this is what you need to recover and save the situation*.'

Whilst the recovery is key, it is essential for the trainee to feel what it is like whilst entering the spin, as well as practising the recovery. So, whilst the instructor will put it into the spin in the early stages of training, it is desirable that the trainee can handle them from start to finish. The exercises in this section require good handling skills and trainees are unlikely to be able to fly them without good demonstrations, several attempts and some coaching.

Many gliders will recover from a spin simply by releasing the controls. It is possible that the student simply relaxes and that is sufficient for the glider to recover. The K13 will do this, but many gliders will take a long time to recover in this situation and some won't. It is important that as much spin training as possible is done in types that require the full recovery action. Starting on a simulator is a very good, and cheap, way to practise full standard recoveries. The trainee should be made aware of the variations between gliders and that they should be aware of the spin and recovery characteristics of every glider they fly.

Stall/spin avoidance is the main aim of the training. An inadvertent low spin does not give a pilot time to work out what has happened and recover before disaster. It is logically impossible to provide training in inadvertent spins, although the syllabus requires us to attempt to distract the trainee at the point of entry on some entries, so its importance lies in making recognition, and avoidance or recovery, as automatic as possible.

The crucial action is to move the stick forward to unstall the glider EVEN though the nose is dropping or pointing steeply downwards. It is the inability of pilots to take this action when the nose drops unexpectedly which results in stalling and spinning accidents.

Opportunities for continuous full spins may be quite limited, but taking an aircraft to departure is readily possible and provides the really key point of training: to recover at this stage.

Difficulties in demonstrating/teaching these exercises:

Spin recovery often happens so quickly that there is insufficient time for much simultaneous patter. The trick is to lead with the patter and say *stick central*, f*ull opposite rudder, then stick forward* **before** moving the rudder and stick. There is seldom time to refer to the ailerons, but they can be mentioned in flight, between exercises.

Excessive speed can build up after spin recovery if the pull-out from the ensuing dive is either late, or too gentle. Such a recovery will also use considerably more height. Trainees should be taught to recover with significant G to minimise loss of height. Likewise, if the pilot fails to recognise a spiral dive for what it is, and/or does not roll level before pulling out the speed can become very high. At high speeds and/or high G loadings, avoid pulling out and rolling level simultaneously as the resultant loads on the glider can be very high.

The best way to slow down from excessively high speeds may be simply to accept a high G loading, and **NOT** to open the airbrakes.

Opening the airbrakes in this situation creates additional problems [see chapter 5], chief of which is the change in load distribution caused by opening the airbrakes. This reduces the usual airframe limit load from +5.3G (airbrakes closed), to +3.5G when open. (Typical values for most modern gliders). Additionally, they may suck open very forcefully.

A high-speed high G recovery may be an alarming experience occurring as it does seconds after a spin. It will be less so if the trainee is introduced to it first. It may be helpful to teach them to fly up to the likely recovery speed and pull recovery G before spinning. They will find spins less alarming and be less likely to mishandle early spin recovery attempts.

Keeping the above in mind, have your hand just in front of the stick during the trainee's spin recovery to prevent excessive forward stick movement.

Many pilots think they apply full opposite rudder when in fact all they do is centralise it. Encourage the trainee to apply full opposite rudder if the spin is fully developed.

The SFCL syllabus uses the term 'incipient spin.' It is helpful to point out and demonstrate that for the first half of a turn, the spin is generally not fully established, and a simple unstalling of the wings, by pushing the stick forward, is all that is required. At this stage it may be difficult to determine whether a spin or a spiral dive is going to develop, and applying full opposite rudder at the start of a spiral dive is undesirable. Once a spin is fully established the complete standard recovery is required; this typically takes up to one complete turn.

The Exercises

There are several separate exercises in this chapter:

- The spin
- The spiral dive
- The changing effect of rudder at the stall and a further spin avoidance exercise.
- 2 further spinning exercises

Every trainee must fly at least the stall with wing drop and spiral dive pre-solo. Recognitions of full spins and recovery must be achieved prior to SPL licence standard. The further spinning exercises are excellent for further post-licence refresher training.

THEORY BRIEFING

THE SPIN

If the glider stalls asymmetrically due to yaw, air turbulence, non-symmetrical wing profiles or (most commonly) misuse of the controls, one wing will stall before the other and go down. This increases the AoA and its drag, which in turn increase the yaw rate, stalling the wing further. At the same time, the upgoing wing's AoA decreases, making it less likely to stall and reducing its drag. The two effects combined initiate a rotation.

Unless the glider is unstalled, it will rotate automatically (Autorotation); rolling, yawing and pitching simultaneously and describing a steeply descending helical path.

A stall with wing drop can result in a spin if the glider remains stalled, or a spiral dive (discussed below) if it unstalls. The characteristic symptoms of the spin (i.e., those which are obvious without input from the pilot) are:

- a usually nose-down and rapid rotation of the glider (if the spin is unstable the rate of rotation and the pitch attitude may change periodically and significantly).
- low or flickering indicated airspeed (IAS).
- very high rate of descent.
- no increase in G.

Spin Recovery Action

- **Centralise the ailerons** - to reduce the down going wing's AoA.
- **Full opposite rudder** - to reduce the amount of yaw, and indirectly (as a result of roll coupling) to help pitch the nose down.
- **Move the stick progressively forwards until the rotation stops** - to unstall the glider, even though the nose is already pointing downwards.
- **Centralise the rudder immediately the rotation stops (or when the spin changes to a spiral dive)** - to prevent high sideways loads on the fin as the speed increases.
- **Recover from the ensuing dive**.

Any given glider's spin characteristics are related to several factors. The most important one is the CG position. The further aft the CG (i.e. the lower the pilot(s) weight), the easier it is to spin and the harder it is to recover. Conversely, the combination of a heavy trainee and a big instructor may move the CG forward to the point where the elevator lacks the authority to maintain the necessary high AoA. After half a turn the nose drops - even with full back stick - and the glider enters a spiral dive. The 'spinning glider' appears to recover all by itself. This is NOT an indication that it will not spin, simply that conditions were not favourable for it to do so.

Airbrakes can have a stabilising effect on a spin **but may make recovery more difficult. Flaps** and their effects vary from glider to glider. In general, lowering the flaps (thermal or landing) makes the glider more prone to spin, whereas raising them (cruise settings) will tend to discourage it. A good example is the ASW20 which is reluctant to spin with neutral or negative flap, but spins like a top with landing flap and gear down.

Misuse of the rudder at lower speeds produces different and dangerous effects. When close to the ground, misleading visual rewards (an apparent increase in the rate of turn) may lead the pilot to unconsciously over-rudder which can lead to spinning.

Pilots commonly over rudder when under pressure, and low. This is frequently associated with poor speed control. A possible cause is the visual effect of the lower wingtip which describes a forward track over the ground as we get lower, instead of backwards as is usual at height. This effect typically appears when below 300', depending on groundspeed. When observed in peripheral vision it encourages pilots to apply extra rudder to try to remedy the non-existent problem. The result is extra yaw which lowers the nose against the horizon, which in turn encourages the pilot to bring the stick back. So, they end up in an over-ruddered, low, slow turn, EVEN THOUGH THE ATTITUDE LOOKS NORMAL (the string, of course will be deflected well into the turn). Be vigilant for this problem, especially when the pressure is high e.g. in launch failure training.

THE SPIRAL DIVE

The glider rolls towards the dropping wing but instead of stalling and spinning it goes into steeply descending dive with speed and bank increasing. It is possible to go through Va and approach VNE very rapidly and therefore easy to over stress the glider. It is important to stress to the trainee that the stages of the recovery must be done in sequence.

In a spiral dive:

- The speed increases rapidly
- G increases if the stick is held back or moved back.
- The rate of rotation is markedly slower than most spins.
- The controls feel heavy but are effective.

Spiral Dive Recovery

- Relax the backpressure to reduce G.
- Roll the wings level using coordinated ailerons and rudder,
- **then** smoothly recover from the dive, keeping the wings level.

Key differences between spin and spiral dive	
Spin	**Spiral dive**
Elevator will not raise the nose	Elevator still effective
Rapid rate of rotation	Slower rate of rotation
ASI low or flickering	ASI increasing rapidly
Normal G	G increasing
Very high rate of descent	Bank increasing
Nose down or 'nodding'	Nose down

MINIMUM HEIGHTS FOR SPINNING - CALCULATIONS

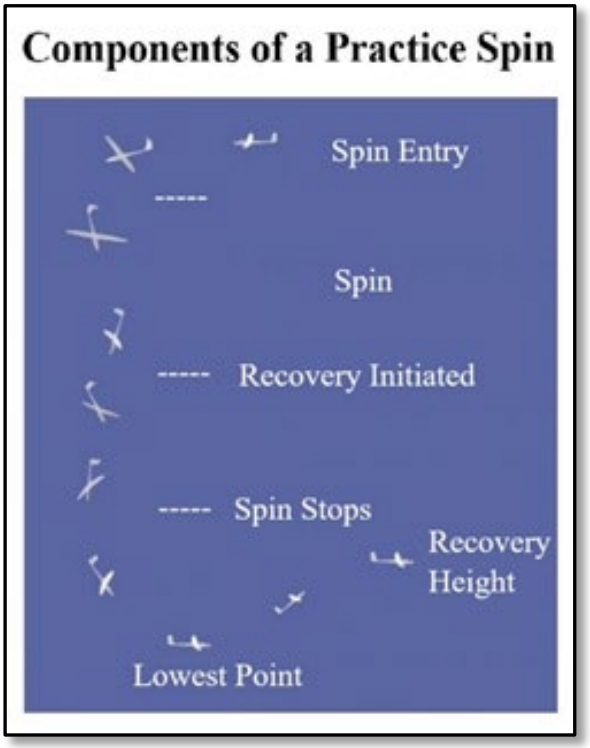
Height loss must be carefully taken into consideration before deciding if it is safe to initiate a spin.

Cockpit weight/CG position is a big factor in how gliders behave when spinning. Weather conditions may also be relevant. For instance, a glider may spin very differently if the wings are wet. The minimum safety height for initiating a spin has to include a safety margin which takes some account of these variables. Some gliders reliably recover promptly, but some have characteristics that can delay recovery and incur extra height loss.

In the case of Non-EASA/JAR Compliant Gliders the flight manual should indicate if the glider was designed to EASA or JAR requirements. If it was not, advice should be sought from the manufacturer unless the flight manual is unambiguous regarding any spin recovery delay and loss of height.

All trainees must be trained to calculate the minimum height at which spinning may be initiated.

Fig 1



The **Lowest Point of the Recovery** is defined as the height at which level flight has just been achieved at the bottom of the recovery dive. In other words, the absolute lowest point of the complete spin and recovery manoeuvre. **This is not the height at which recovery action is initiated.** See fig 1 above.

When instructing, selecting the lowest point of the recovery must make allowance for possible, 'unexpected student actions.' The greatest additional loss of height, is likely to result from a sharp pull out of the dive, inducing a flick and spin in the opposite direction. This is likely to consume a further 400ft. Taking this into consideration gives a sensible target lowest point of the recovery of 700ft. AGL. leaving an additional 300ft to avoid terrain and should, following recovery, yield a regained altitude sufficient to re-join the circuit assuming the exercise is conducted close to the airfield.

When deciding on the **Minimum Height to Initiate a Spin Recovery**, guidance should be taken from the glider's flight manual as to height loss per turn. It should also be assumed that it will take between ½ to ¾ of a rotation to move the controls to the recovery position, plus the possibility of a further full rotation before the spin stops. A further 150 to 250ft should then be added for the dive recovery as appropriate to the glider type.

When instructing, when deciding on the **Minimum Height to Initiate a Spin**, consideration should be given to the factors above and the length of the spin required to teach the exercise effectively.

The Calculation:

Minimum height to commence the spin =

Ht loss per turn x the number of turns (see flight manual FM)

Plus

The time to initiate the recovery (assume ¾ turn)

Plus

Any delay to recovery (assume at least 1 further turn)

e.g. trainee fails to recover so the instructor takes control

Plus

Recovery from the dive (see FM)

Plus

The 700' minimum ground clearance

Recommendations:

When instructing, prior to any spin training a thorough pre-flight brief must be given, including spin recovery actions and clear handover instructions to avoid confusion as to who should be recovering the glider from the spin and any conflict on the controls

Before spinning and preferably before flight the following should be decided upon:

a) minimum height at which **spinning may be initiated**

b) minimum height at which spin **recovery must be initiated**

ADDITIONAL NOTE: TRAINING GLIDERS FOR STALL & SPIN TRAINING

Unfortunately, many of the two seat trainers currently in use do not spin readily. A two-seater so benign that it can be turned with the stick on the back stop can set a dangerously misleading example to its trainees. If we get ourselves into a difficult situation, such as a low final turn, we all tend to revert to what we first learnt (primacy), and the distraction may well result in our behaviour reverting to habits inappropriate to the type flown. It is worth remembering that gliders do not spontaneously stall or spin, consciously or otherwise it is pilots who stall and sometimes spin them.

It is difficult to find training gliders that spin. Even with the better two-seater spin trainers, trainees need to understand that there can be significant difference in spin and recovery characteristics from other gliders that the pilot might fly in the future.

Some training gliders have the facility to ballast the airframe to allow spinning exercises. It this situation the recovery and behaviour may be unusual making it crucial to read and scrupulously follow the flight manual, including the need for accurate weighing of airframe and contents. **The gliders flight manual must be consulted prior to spinning to find out if there are any CoG requirements or special recovery procedures.**

The Flying

RECOGNITION AND AVOIDANCE OF SPINS

AIR EXERCISE BRIEFINGS

Before all of the flying exercises in this chapter discuss Threat & Error Management, along the lines of the example below, and the HASSELL check in all of the pre-flight briefings.

TEM

Threats:	**Mitigation:**
Trainee Adverse Reaction	Brief appropriately & monitor trainee
Trainee fails to or overreacts at recovery	Monitor trainee & take over promptly
Collision	Maintain thorough lookout
Errors:	
Running out of height for appropriate circuit	Monitor height and position
Allowing a spin to continue at an inappropriate height	Be prepared to recover before safe margins are eroded

For all these exercises remind the trainee of the aim of the exercise and a brief description of the exercise itself. In the early stages of spin training, fly the first demonstration with the trainee's hands and feet off the controls, until you are sure the trainee will not have an adverse reaction.

RECOGNITION AND AVOIDANCE OF SPINS

SPIN FROM UNDER-BANKED OVER-RUDDERED TURN

MANOEUVRE DEMONSTRATION

THIS exercise is almost a repeat of the earlier 'stall with a wing drop' exercise. (Chapter 9.) Here, however, it is related to a scenario in which you have got a little low and/or far away from the site and unintentionally fly slower than usual trying to stretch the glide.

HASSELL check.

Describe the configuration that potentially leads to a spin

- *Notice that the nose is not high - only just above the normal flying attitude.*
- *Check height from the altimeter (for determining height loss afterwards)*
- *We are in a turn with a shallow angle of bank.*
- *The glider doesn't turn quickly enough so you try to bring the nose round faster with the rudder.*
- *This appears to work because the glider looks as if it is turning more quickly.*
- *Not wanting to increase the bank angle, we oppose that by applying opposite aileron.*
- *The nose starts to go down. We try to stop it with the elevator, but even with the stick fully back the nose will not come up. We are now spinning.*
- *Notice the low or flickering ASI reading*
- *Notice the high rate of rotation.*
- *Notice the normal G.*
- *The stick is fully back but not raising the nose.*

To Recover:

- *Centralise the ailerons,*
- *full opposite rudder*
- *stick progressively forward until the spinning stop*
- *.... centralise rudder, recover from the ensuing dive.*

Check the height. Work out the total height loss and estimate the low point.

TRAINEE ATTEMPTS

As with other exercises the spin is best taught in stages and in this case backwards.

- First teach the trainee to recover from the dive,
- then to recover from the spin, holding the glider in a spin,
- then how to enter the spin.

As failures to spin are almost certain to occur, take the opportunity to cover the spiral dive.

In line with the SFCL SPL Syllabus, when the trainee appears to be 'getting the hang of it.' attempt to generate a distraction whilst they are entering a spin. This intention being to give a feel for what it would be like to find oneself unexpectedly spinning and need a recovery from there.

SPIRAL DIVES

Rather than trying to initiate a spiral dive, make use of those occasions when the glider fails to spin and instead enters a spiral dive. Do not delay recovery too long. If the spiral dive does not happen accidentally then demonstrate it deliberately, by not pulling the stick right back at departure.

- *Notice the increasing speed, increasing G, and the lower rate of rotation.*

To recover:

- *Level the wings with coordinated aileron and rudder,*
- ***and then** ease out of the dive keeping the wings level.*

DE-BRIEFING

Draw to the trainee's attention the dangers of uncoordinated turns, particularly low down. When starting to turn, an inadvertent spin is initially masked by the turn and may go unrecognised. If any doubt exists, move the stick forward.

The approach to an inadvertent spin is typically with the nose of the glider below the horizon, not very different from the normal flying attitude. Reinforce the need to move the stick forward even though the nose is pointing steeply downwards. It is the failure of the pilot to move the stick forward when the nose is going down that allows the glider to spin!

Ensure they are clear about spin & spiral dive recognition and recovery actions. Check that the trainee understands that excessive speed can build up quickly after a spin or in a spiral dive and how to deal with that in relation to Maximum Manoeuvring Airspeed, the limit load and use of airbrakes.

RECOGNITION AND AVOIDANCE OF SPINS

CHANGING EFFECT OF THE RUDDER AT THE STALL

(Misuse of the rudder precipitates a spin)

AIR EXERCISE BRIEFING

This exercise shows the trainee the primary and secondary effects of the rudder at the typical cruise speed, and how misuse of the rudder at lower speeds produces different and dangerous effects. This exercise is more one of spin prevention than simple stall avoidance.

Before any of the flying exercises include Threat & Error Management, along the lines of the example shown earlier and the HASSELL check in all of the pre-flight briefings.

Point out to the trainee that at normal airspeeds they will see the expected effects of the controls, but at very low airspeed the effects will be markedly different.

MANOEUVRE DEMONSTRATION

Complete the HASSELL checks. Fly at normal flying speed.

- *Keep your hands and feet clear of the controls.*
- *Notice we are flying at normal flying speed.*
- *I am going to apply full left rudder.*
- *I want you to tell me how much the glider yaws and rolls.*
- apply full left rudder.
- wait for two or three seconds.
- *How much yaw and how much roll was there?* (Figures in the order of 30° yaw and 10° roll or 'lots of yaw and not much roll' are acceptable)'

If the trainee is not sure what happened, repeat the exercise before continuing with the next part.

Then: fly the glider just above the stall. The glider may need to be 'on the buffet' for this to work.

- *Notice that we are now flying near the stall.*
- *I am going to apply full left rudder again.*
- *Tell me how much yaw and roll you see this time*
- apply full left rudder.
- wait.
- *How much yaw and roll?* (70° roll and 15° yaw or 'a lot of roll and not much yaw').
- *Move the Stick centrally forward to unstall the glider* (Centralise the rudder.)

Emphasise that misuse of the controls near the stall makes the glider spin.

ADVICE TO INSTRUCTORS

The reason for asking the trainee to say how much roll and yaw occurs is to make sure that they have seen the effect for themselves, and to ready them for the second part of the exercise. Do not be surprised to find that the first part of the demonstration has to be repeated. This exercise can be a useful, life-enhancing reminder to pilots who tend to over-rudder turns, particularly the final one!

TRAINEE ATTEMPTS

Teach the trainee to fly the demonstration so that they can appreciate the way in which inappropriate use of rudder can cause a spin.

RECOGNITION AND AVOIDANCE OF SPINS

Spin avoidance exercise – How the glider behaves in a stall in the turn in unbalanced flight - Demonstration only

AIR EXERCISE BRIEFING

This exercise demonstrates how the glider behaves in a turn in both balanced and unbalanced flight. It shows the importance of not misusing the rudder i.e. over-ruddering in the turn.

MANOEUVRE DEMONSTRATION

Perform a HASSELL check.

- Put the glider into a balanced turn at a moderate angle of bank at a normal thermalling speed.
- Gently bring the stick back to the point of stall.
- Point out that it is in a balanced slightly stalled turn.
- Notice the nose is just above the horizon, the yaw string is slightly out to the left and the slip ball is slightly to the to the right. The glider should remain
- on the point of stall, although it may eventually drop a wing.

Then demonstrate what happens if you stall the glider in unbalanced flight i.e. an over-ruddered turn.

- Lookout.
- Roll into the turn but leave in too much rudder.
- Notice the nose is now lower on the horizon but the yaw string is out to the right and the slip ball is out to the left.
- Bring the stick back to the stall, the glider will then buffet and rapidly drop a wing and start to depart into the spin.
- To recover, stick centrally forward, roll the wings level and return to the normal gliding attitude.

Point out that the glider departed much more rapidly in an over-ruddered turn.

DE-BRIEFING

Although trained never to use excessive rudder, there can be psychological pressures (such as being low with the final turn still incomplete) to do so. Due to high workload, even the most experienced pilot may find themselves over-ruddering subconsciously in order to get the glider round e.g.; when soaring at low altitude, doing a low circuit turn, or a field landing.

Misuse of the rudder is not only inefficient, but if the glider is at/or near the stall, it can cause it to spin. The only protection is to take care to ensure the glider is being flown accurately, well away from the stall!

RECOGNITION AND AVOIDANCE OF SPINS

SPIN OFF A STEEP OR THERMAL TURN

AIR EXERCISE BRIEFING

For this exercise to work the speed and steep angle of bank must be steady. The spin entry is likely to be far more dramatic than from an unaccelerated flight condition.

It is necessary to pull back on the stick and hold it back as the wing drops and the rudder is applied. This is realistic since the majority of spins are triggered by misuse of the elevator.

SPIN OFF A STEEP TURN – MANOEUVRE DEMO

Spin training may have concentrated on the spin from an under-banked turn. The purpose of this demonstration is to show that the glider will spin from a well-banked, unbalanced turn at airspeeds normally considered to be safe.

Complete the HASSELL check.

Describe and demonstrate a scenario in which an attempt is made to soar low down, in a narrow thermal. The speed should be well above the normal 1G stalling speed.

- Turn with 45° of bank and at a speed a few kts above the accelerated stall speed for that bank angle.
- *Notice the speed is X kt, well above the normal stalling speed.*
- *The nose looks to be safely <u>below</u> the horizon.*
- Gradually increase the rudder in the direction of the turn, whilst at the same time maintaining the attitude with the elevator, and the bank angle with the ailerons. In some types it works better if you do not use the ailerons against the final wing drop but do get the stick hard back as the nose goes down.
- The glider spins. Initiate the recovery.

Note: the outcome i.e. the glider will spin if a turn is tightened with insufficient speed for the new angle of bank, especially if it is over ruddered at this may also be demonstrated.

SPIN OFF A STEEP TURN – TRAINEE ATTEMPT

This exercise is demanding of the trainee's handling. You may need to start by coaching them to turn accurately at 45° of bank first, then again to use all three controls at once at the appropriate rate to maintain the attitude as long as possible as the glider stalls and ultimately departs into a spin.

DE-BRIEFING

Emphasise that the glider will spin from an unbalanced turn at speeds well in excess of the unaccelerated 1G stall speed. Discuss how inaccurate flying helped initiate the spin. Point out that some of the more usual symptoms, such as a nose high attitude, sloppy controls, and buffet, were not present.

RECOGNITION AND AVOIDANCE OF SPINS

STALL AND SPIN OFF A SIMULATED FAILED WINCH LAUNCH

Demonstration only – EXCEPT FOR PART 3

AIR EXERCISE BRIEFING

This exercise shows that during reduced G the glider will fly at below the normal stalling speed, and that turning before the glider has accelerated to a safe speed after a launch failure can cause the glider to spin. It also demonstrates that after a push-over manoeuvre the airspeed can be less than the attitude might suggest.

Unfortunately, spins from turns commenced after a winch launch failure are a not uncommon scenario and can have fatal consequence.

Discuss the recovery action in the event of a winch launch failure:

- The attitude required to regain approach speed.
- Avoidance of turns or use of airbrakes until approach speed is reached.
- The desirability of landing straight ahead if possible.

There are 3 parts to the exercise:

1. A slow recovery from a winch launch failure leading to a mushed stall

2. A slow recovery from a winch launch failure followed by an attempt to turn with inadequate speed despite 'normal attitude', leading to a stall with wing drop or spin.

3. A upper air demonstration of the correct recovery after a failed winch launch i.e. waiting for the nominated approach speed. The trainee then attempts this last part demonstrating the correct push over and pause for the nominated speed to be achieved.

STALL OFF A FAILED WINCH LAUNCH - MANOEUVRE DEMONSTRATION

Remind the trainee of what the normal attitude looks like (typically 50kt).

Exercise part one

Complete the HASSELL check.

Describe a winch launch failure where the nose is lowered to the normal gliding attitude. If the speed decays to below the normal 1G speed during the push-over, then the glider will mush-stall when held in the normal attitude.

- Increase the speed to 70kt. Raise the nose to the attitude appropriate for a winch launch.
- Briefly maintain this attitude and say; *The launch has failed.*
- Positively lower the nose to the normal attitude and then pull back on the stick to maintain the attitude.
- If the timing is right then the glider will settle into a mushing stall.
- If possible, maintain the stall for a few seconds, and then recover in the normal way.

Exercise, part two

Complete the HASSELL check, noting your height at the start of the exercise.

Describe a winch launch failure where the nose is lowered after the failure, but a turn is begun before the glider has had time to accelerate to a safe speed.

- Increase speed to 70kt. Raise the nose to the attitude appropriate for a winch launch.
- Briefly maintain this attitude and say; *The launch has failed,* positively lower the nose to the normal airbrakes closed approach attitude, hold that attitude and immediately commence a coordinated turn.
- The glider instantly stalls, and if the controls remain deflected, as for the intended turn, the wing may drop.
- Bring the stick back to attempt to maintain the attitude and use aileron against the wing drop. (Ie. behave as a panicking pilot would.)
- If possible, allow a spin to develop.
- Recover using stall, spin or spiral dive recovery as appropriate.

Establish how much height has been lost and relate this to a low-level cable break and any wind gradient delaying acceleration to a safe speed.

Exercise, part three

Complete the HASSELL check.

- Describe a winch launch failure that occurs during the full climb.
- Dive the glider to about 70kt and then pull up smoothly into a 45° nose up attitude.
- Assume that the launch has failed.
- Lower the nose to the recovery attitude (below the approach attitude).
- Check the ASI and wait for the airspeed to increase to the nominated approach speed; adjust the attitude to hold the desired airspeed
- Ask the question; 'Can I land ahead?'
- Do not turn or open the airbrakes until approach speed is attained.
- Release the cable.

TRAINEE ATTEMPTS

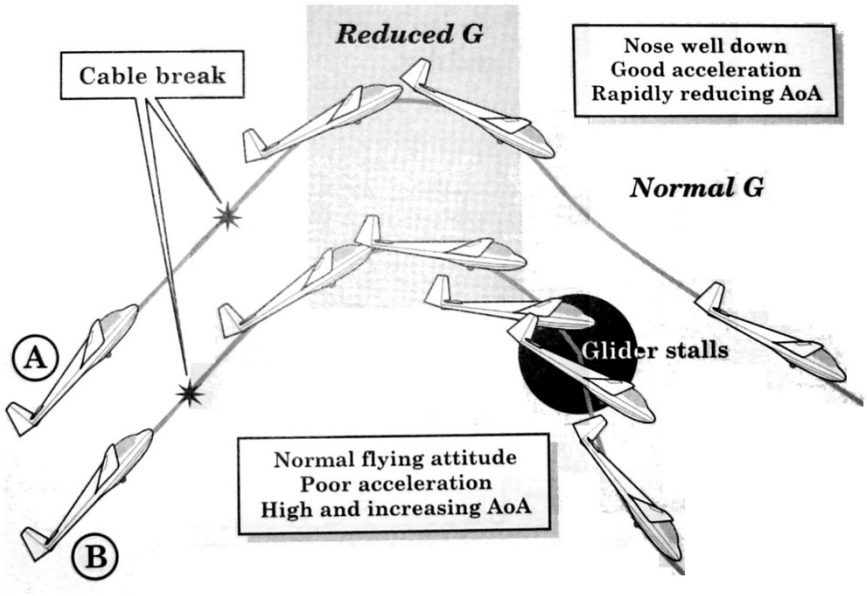
The trainee should ONLY practise part three of the exercise: the correct recovery.

- Explain that you will give them control at the point of winch launch failure.

- Increase speed sufficiently to allow a rotation into the winch launch attitude, then raise the nose to that attitude.
- Briefly maintain this attitude and then say *You have control.*
- The trainee should push over to the recovery attitude and wait for the nominated airspeed (at least 55kts) before adjusting the attitude and manoeuvring.

Before attempting any manoeuvre after a launch failure, the glider must have a safe airspeed. This will require a more nose down attitude than the normal approach attitude (the recovery attitude). This is necessary to avoid a stall on recovery because speed decays rapidly following a launch failure.

Emphasise that attitude itself is not necessarily an adequate indicator of speed. Although the nose was lowered as the aircraft approached the stall, insufficient time was allowed for the glider to regain flying speed. You need to use the reduced G 'window' caused by pushing over to get the glider into a nose down attitude in which it will gather speed quickly. See Figure 2.



For parts one and two of this exercise the airspeed at the peak of the pushover should be below the 1G stall speed but above the 0.5G stall speed. For example, the speed at the peak of the pushover for a glider with a normal 1G stalling speed of 36kt, would be approximately 32kt.

DE-BRIEFING

Ensure that the trainee understands the significance of G on stalling speed and that the normal attitude does not on its own mean that speed is sufficient to manoeuvre. Make sure that they have grasped the importance of checking the ASI before manoeuvring, especially in the event of a launch failure.

COMMON DIFFICULTIES

No habitual response i.e. the trainee has not yet developed the HABIT of making an immediate spin recovery, nor making an immediate dive recovery once the spin has stopped.

Uncertainty about the extent of HASSELL check required, and where in the sky to check for others.

Sickness, disorientation or excessive fright. The exercise will often need to be discontinued and resumed another day.

Lack of understanding of the placard limits - especially manoeuvring speed, the speed above which control movements can damage the glider.

Fails to make the glider enter a spin. This often results from the trainee's misconception that spinning is something that happens quickly. As a result, there is usually a rushed attempt to stall and provoke the spin, followed by a rushed recovery, usually before the glider has done anything very much.

Fails to maintain the spin. Usually due to failure to keep the stick back. This assumes that the glider is a type which can normally be stabilised in a spin.

Extreme forward CG location - i.e. TRAINEE is near the maximum cockpit weight.

Recovery problems. The trainee:

- confuses spin and spiral dive and takes inappropriate recovery action.
- fails to use full opposite rudder.
- inappropriate forward movement of the stick - usually too much, too fast.
- fails to recognise when the spin has stopped.
- continues with spin recovery instead of dive recovery.
- lack of immediate or efficient dive recovery even though the end of spinning has been recognised. The trainee may never previously have encountered such an attitude.
- either keeps the stick too far forward or continues to push the stick forward after rotation has stopped. Trainees often hate the negative G that ensues. Tell those who have trouble with this to bring the elevator neutral as well as the rudder immediately the rotation stops. This also significantly reduces the subsequent height loss.
- fails to centralise the rudder.
- keeps the nose below the horizon after recovery. Speed remains high. Raising the nose would regain some of the lost height

