Stall / Spin refresher

04/08/10ml/v2

Why stall / spin training?

Inadvertent stalling or spinning is a killer

- One pilot every seven months has been seriously hurt/killed for the last 35 years
- 95% of spin accidents are fatal
- Read AAIB finding S & G p68

Don't let it be you!
Last BMGC – K6 crash into Beacons 2005

Why do these accidents happen?

A couple of facts:

- A glider does not stall or spin it is the pilot

- Inadvertent stalling or spinning is very dangerous
- Practice stalling and spinning is very safe

Most cases due distraction / overload
The pilot is not recognising the potential stall/spin symptoms through the fog of distraction

Typical distraction examples

- Landing out – late decision (Astir 2009)
- Low circuit – getting low in circuit, low final turn (Pirat/ESGC)
- Manoeuvring close to hills, bowls. (K13/ Dunstable)
- Launch failure – low level manoeuvring

In each example above a pilot has been seriously hurt or killed by spinning in.
Each case was totally avoidable if the P1 had recognised the symptoms and had taken preventative action

Obviously earlier and more effective decisions would have reduced the workload and made the accident less likely.

However you can never assume that it will not happen to you – so it is very important you can recognise the symptoms and know what to do.

Think – I am now in stall/spin territory. Keep flying the glider. Do not allow yourself to get distracted

How do I prevent it happening to me?

Learn and practice to recognise the symptoms, prevention and recovery for each glider you fly so that it becomes second nature

At least once a year fly dual with an instructor to practice and learn

Why does the glider stall?

- Normal flight - wing must produce lift roughly equal to weight of glider
- Lift depends on speed of airflow past wing and angle at which relative airflow meets it – angle of attack
- The angle of attack (angle between Chord line and relative airflow) reaches the critical angle (15deg)

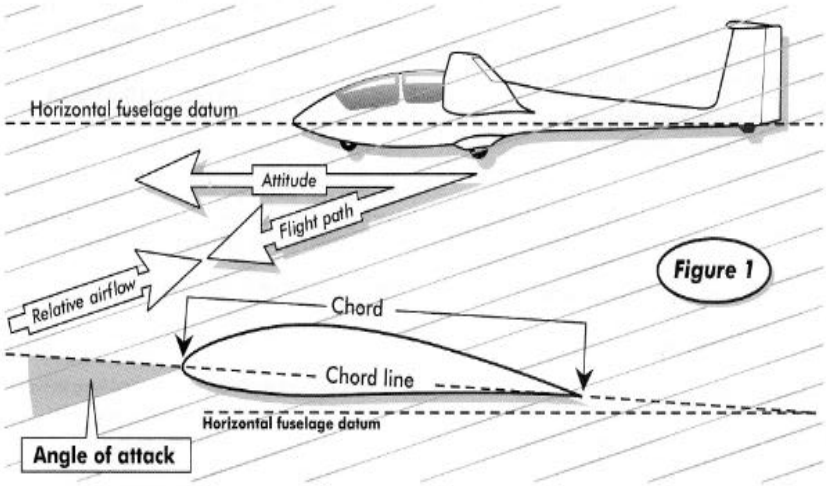
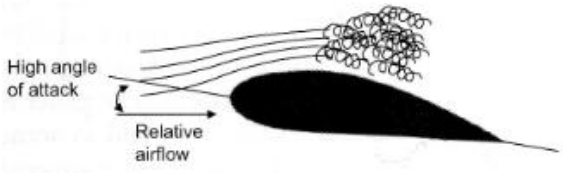
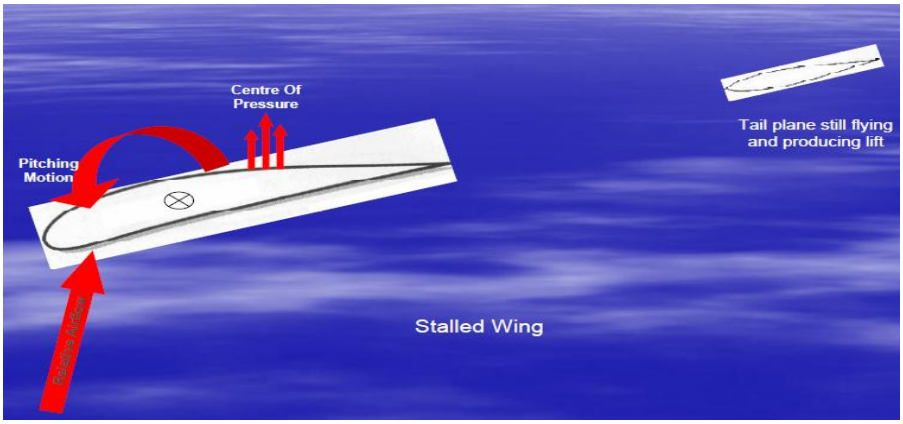


Figure 1

- Airflow breaks away over top of wing (buffet)
- Lift reduces and drag increases
- Wing no longer support glider weight so accelerates downwards



- As wing stalls centre of pressure moves back
- Tail plane is still ‘flying’
- Nose pitches down



Accelerated stall

- Stall speed increases with the square root of the load (G)
- Therefore care required when manoeuvring (turning) the glider
- At higher angles of bank (i.e. final turns, turning inside the West bowls, launch failure) the speed at which glider will stall increase significantly

Bank angle	Load Factor	Stalling speed (kt)
	0	0
	0.1	12
	0.25	19
	0.5	27
0°	1	38
15°	1.035	39
30°	1.15	41
45°	1.41	45
60°	2	54
75°	3.8	74
80°	5.76	91
85°	11.5	129

Why does the glider spin?

The glider is likely to spin if yaw is present at the stall (i.e. a turn, turbulence)

- One wing stalls before the other and drops
- Angle of attack (angle to the relative airflow) on dropping wing increases causing further loss of lift
    - More deeply stalled and drag increases
- Up going wing is less stalled
- Difference in drag between upper & lower wing – glider now yaws in direction of down going wing
- Down going wing will now be even slower – more stalled
- Process continues unless wing un-stalled
- Stalled autorotation – simultaneous rolling/pitching/yawing

Spiral Dive
Similar sensation – but the wing has not stalled

- Any stall with wing drop can result in Spin or spiral dive
- Any inattention or poor handling when turning can result in spin or spiral dive

It is important to recognise the difference between the two and take the correct corrective action

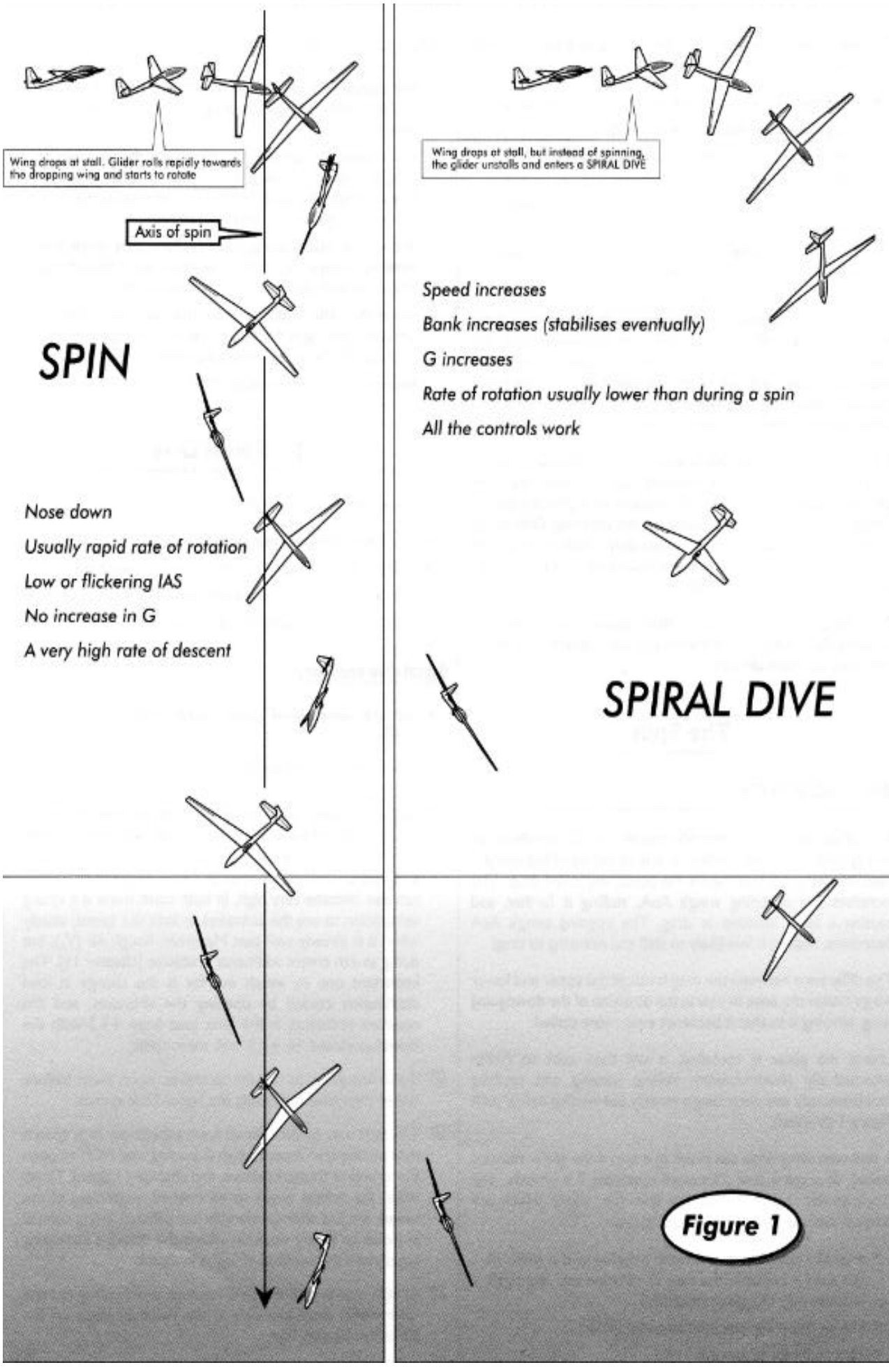

Wing drops at stall. Glider rolls rapidly towards the dropping wing and starts to rotate
Axis of spin
SPIN
Nose down
Usually rapid rate of rotation
Low or flickering IAS
No increase in G
A very high rate of descent
Wing drops at stall, but instead of spinning, the glider unstalls and enters a SPIRAL DIVE
Speed increases
Bank increases (stabilises eventually)
G increases
Rate of rotation usually lower than during a spin
All the controls work
SPIRAL DIVE

Figure 1

HAFSSLL – checks

H – Do we have sufficient height for the manoeuvre barring mind the height loss and distance to the airfield?
A – Glider cleared for manoeuvre. Max 'G' loading, VA & VNE
F – Set for the manoeuvre
S – Straps – locked and tight (front/back)
S – Security – no loose articles (front/back)
L – Clear airfield, not over a built up area, clear of controlled airspace
L – Well banked turn left/right. No conflicting traffic around and below (powered a/c can do 2-3 miles per minute)

Further manoeuvre update - HLL

Symptoms of the approaching stall

Stall symptoms

1. Attitude – above normal gliding attitude for this stage of flight
2. Airspeed reduces (ASI flickers)
3. Noise – it gets quieter
4. Effect of controls may change (ailerons get sloppy)
5. You feel/hear buffet (masked if airbrakes are open)
6. Unusual stick position for this stage of flight (stick position = Angle of Attack. Stick back = high AoA)
7. High rate of decent
8. **Elevator will not raise the nose further or prevent it from dropping – this symptom will always be present** Stick = AOA. Stick Back = High AOA

Any of these symptoms present – take corrective action

- Stick centrally forward
- Regain flying speed
- Return to the normal gliding attitude

How do you know you are stalled?

Stall Symptoms – you are stalled

- High rate of decent
- Nose may un-commanded pitch down (even though stick is coming back)
- Wing may un-commanded drop – even though stick central or even opposite direction
- Ineffective elevator – not raise the nose further or prevent it from pitching down

Recovery

- Stick centrally forward
- Regain flying speed
- Level wings – if required (if wing has dropped)
- Return to the normal gliding attitude
- Recover with minimum of height loss – progressively but positively raise the nose

Spinning

Remember a spin is a result of stalling with yaw
Therefore stall symptoms present

- Nose un-commanded pitch down (even though stick is coming back)
- Wing un-commanded drop – even though stick central or even opposite direction
- Ineffective elevator

Plus:

How do you know you are spinning?
Spin Symptom

- Low IAS – (stick is well back)
- High rotation rate
- Normal G (stable state)
- High rate of descent

Recovery

- Full opposite rudder (visual check correct)
- Stick **CENTRALLY** forward until rotation stops
- Centre rudder
- Recover from dive

Despite nose down attitude move stick forward to un-stall wing

Spiral Dive

How do you know you are in a spiral dive?
Symptoms

- stick position (not so far back)
- Increasing speed – feeling of increased speed, noise/feel of controls
- Increasing G
- Slower rotation rate
- Controls heavier/effective

Recovery

- Level wings with aileron/rudder together
- Stick **back** to recover
- Recover from dive