

Spin Training

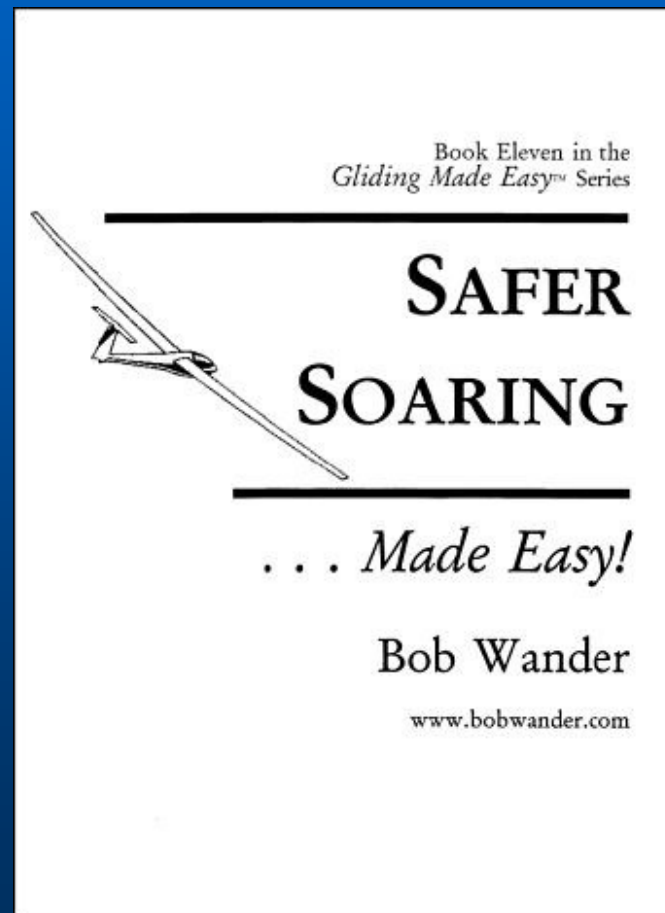
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This Presentation Is Based On A Chapter In:



Why Is Spin Training Important?

- Spins have been with us since the Wright Brothers, and probably always will be
- Spin accidents are usually fatal
- Ignorance of spins contributes to spin accidents
- Fear of spins causes many pilots to avoid spin training

Why Do Pilots Avoid Spin Training?

- **Pilots avoid maneuvers that they understand poorly or not at all**
- **Few fixed-wing pilots understand what drives auto-rotation (in other words, what makes an aircraft spin)**
- **Some pilots often believe spins are chaotic and unpredictable, and avoid spin training as a result**

Three Spin Questions

- **At spin entry, why does the aircraft nose pitch down?**
- **At spin entry, why does the aircraft roll left or right?**
- **At spin entry, why does the aircraft yaw develop into continuing rotation?**

At Spin Entry, Why Does The Aircraft Nose Pitch Down?

- **The aircraft nose pitches down because the spin is a variety of stall. In a properly loaded aircraft, this nose-heavy tendency at the stall is caused by the CG being placed forward of the center of lift.**

At Spin Entry, Why Does The Aircraft Roll Left Or Right?

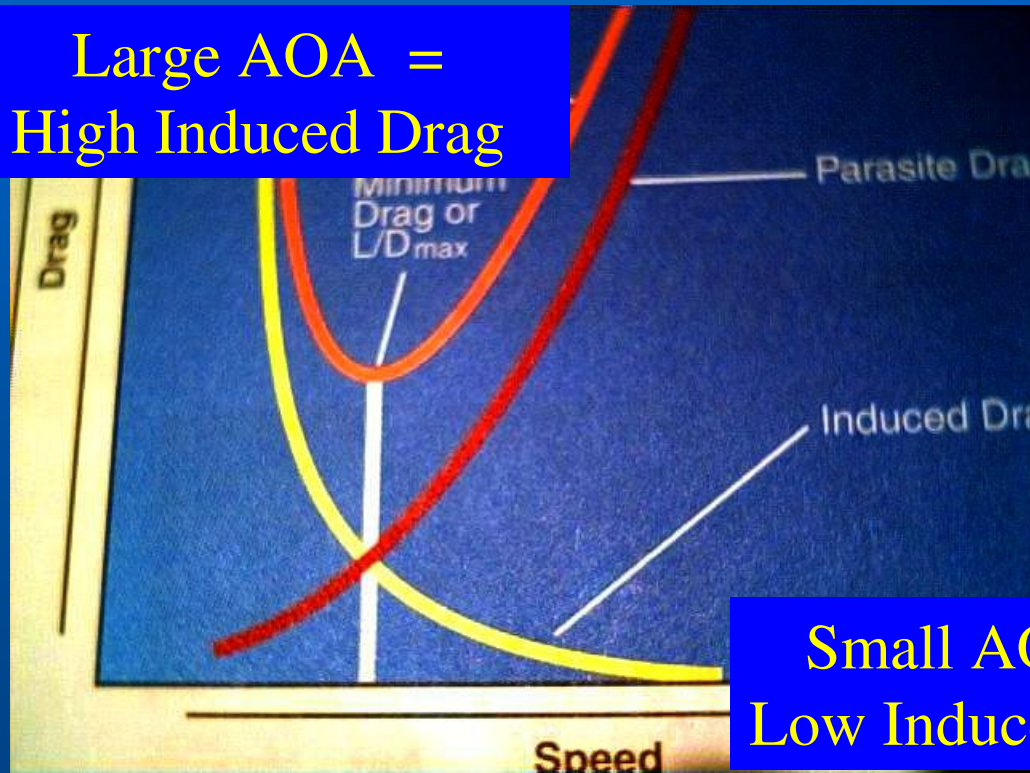
- The aircraft rolls left or right because one wing is more stalled than the other wing.
- The aircraft rolls toward the more deeply stalled wing because it produces less lift than the other wing.

At Spin Entry, Why Does Yaw Develop Into Continuing Rotation?

- A spinning aircraft auto-rotates, or spins, because the more stalled wing is producing considerably more induced drag (or rearward acting force) than the other wing.
- Auto-rotation generally continues until this inequality is reduced or eliminated.

Does The Induced Drag Curve Explain Yaw Behavior In The Spin?

Large AOA =
High Induced Drag



Small AOA =
Low Induced Drag

Three Strikes ... And You're Out!

- **Imagine a glider in the following flight condition:**
 - **A shallow bank (15 degrees or so), slow flight turn to the left, with excess left rudder applied.**
 - **Let's take a look at the aerodynamic configuration of the wing in this condition of flight and analyze any stall-spin risk factors present.**

Strike One:

- **During turning flight, the inner wing has a higher AOA than the outer wing.**
 - **In a shallow bank turn to the left, the left wing is flying at AOA than the right wing.**

Strike Two:

- **During shallow bank turns, over-banking tendency is pronounced.**
 - The pilot puts the stick to the high side of the cabin, increasing the AOA of the lower wingtip/aileron combination and decreasing the AOA of the upper wingtip/aileron combination.
 - In a shallow bank turn to the left, the left wingtip is flying at higher AOA than the right wingtip.

Strike Three:

- **Skidding the turn with the rudder increases the AOA of the lower wingtip and reduces the AOA of the upper wing.**
 - **This inequality in AOA produces inequality in induced drag, causing the yawing moment of the glider and developing into auto-rotation.**

Summary

- **In a shallow bank, skidding turn to the left, the left wingtip is flying at higher angle of attack than the right wingtip due to the combination of three factors:**
 - **curving flight path to the left**
 - **aileron positions at left wingtip and right wingtip to resist over-banking tendency**
 - **skidding turn to the left reduces left wingtip forward speed and increases right wingtip forward speed.**

Three Strikes...

...You're O-U-T.

Why Are Many Two-Seat Gliders Good Spin Trainers?

- Many gliders are excellent stall/spin trainers because they are free of engine noise & vibration, propeller noise & vibration, torque, and P-factor
- Gliders are silent enough that you can actually *hear* the wings stall

Spin Training Methods

- Wings level, nose high, haul back & kick the rudder
- Snap roll
- Shallow bank skidding turn (Nose on or near the horizon)

Wings Level, Nose High, Haul Back & Kick

- This is the long-established method of teaching spins
- Emphasis has been on precision recovery after multiple turn spins
- Three turns, roll out on a pre-selected heading

Advantages of the Wings Level, Nose High Method

- **Teaches ability to remain oriented during the spin rotation**
- **Allows candidate to learn the characteristics of the fully developed spin**

Disadvantages of the Wings Level, Nose High Method

- **Nose high attitude at spin entry reinforces the impression that pitch attitude is extremely nose-high for all spin entries**
- **Pilots trained solely by this method *often conclude that all spins are preceded by extreme nose-high pitch attitude***

Snap Roll Spin Entry

- Spin entry in the horizontal plane
- Useful teaching method in aerobatic airplanes

Advantages of the Snap Roll Spin Entry Method

- Teaches that spins can occur from any pitch attitude
- Teaches precision recovery from snap roll/spin
- Teaches advanced orientation skills

Disadvantages of the Snap Roll Spin Entry Method

- Not often taught in gliders due to substantial structural stresses that snap rolls impart to the long, massive wings of gliders
- Violent control application to initiate snap rolls may lead pilots to *conclude that all spins are preceded by violent control inputs*

Shallow Bank Skidding Turn Spin Entry

- **This is the inadvertent spin entry from low altitude that takes lives every year**
- **Encountered in the traffic pattern when turning from downwind to base or from base to final approach**
- **Few pilots receive training in this type of spin entry!**

Shallow Bank Skidding Turn Spin Entry Teaching Method

- Practiced at safe altitude
- Simulates spin out of turn in the traffic pattern
- Wings are banked, not level, during spin entry
- Spin warning signs are emphasized
- Gradual control inputs
- Recovery is initiated immediately!

Advantages of the Shallow Bank Skidding Turn Spin Entry

- **Realistic simulation (at safe altitude) of the type of spin entry that claims lives every year**
- **Spin entry occurs from relatively flat pitch attitude, not from extreme nose-high pitch attitude**
- **Cross control of ailerons and rudder is applied gradually and realistically, not violently**

When Can I Get Spin Training?

- During primary flight training
- During recurrent training (BFR)
- During recurrent training (seasonal checkout)
- Anytime you can fly with a spin-qualified CFIG! (do you really need to be *required* to seek additional training?!?)

What Type Of Spin Training Is Best For Me?

- Training that emphasizes the warning signs that a spin is imminent
- Entry from shallow bank, skidding turn
- Training with gradual control inputs
- Training that emphasizes immediate and correct application of controls to exit from the incipient spin

What Type Of Spin Training Is Best For Me?

- Spin training in a two-seat glider that has stall/spin characteristics similar to the stall/spin characteristics of the single seat glider(s) that you fly
- Spin training given to you by a CFIG with experience in providing spin instruction

What Types Of Spin Training Are *Worst* For Me?

- The spin training that is worst for you . . . is to have no spin training at all!
- Spin training at unsafe, low altitude
- Spin training that you conduct all on your own without dual instruction in spins from a qualified CFIG

Who *Doesn't* Need Spin Training?



- **Ercoupe pilots don't need spin training!**

Ercoupes Are *Incapable* Of Spinning



Ercoupes Were The *Only* Spin-Proof Airplanes

- If you are flying a fixed-wing aircraft, and it is *not* an Ercoupe, then it is capable of spinning!
- Spin training is your *best defense* against inadvertent spin at low altitude

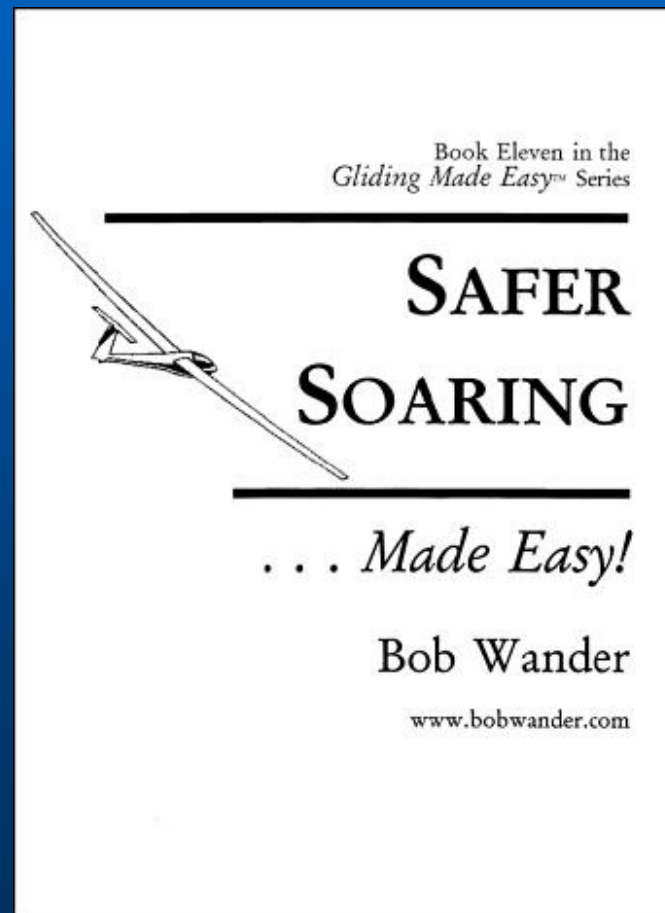
Causes Of Inadvertent Spins In The Approach To Landing

- **Delayed entry into the pattern**
- **Belief that pulling back on the stick will make the glider continue to gain altitude**
- **Distraction**
- **Unexpected fundamental development(s)**

The Cure For Inadvertent Spins

- **Have the self-discipline to arrive in the vicinity of the intended landing area with plenty of altitude and time *to do the job right the first time!***
- **Familiarity with warning signs of approaching stall or spin**
- **Situational awareness**
- **Seek out *recurrent spin training!***

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