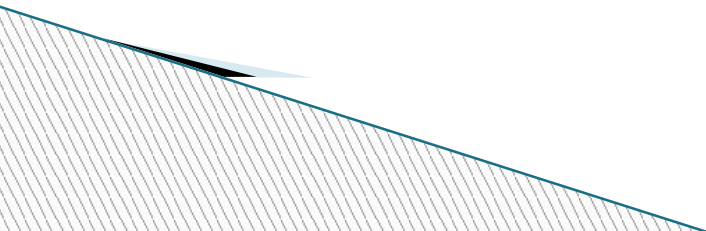
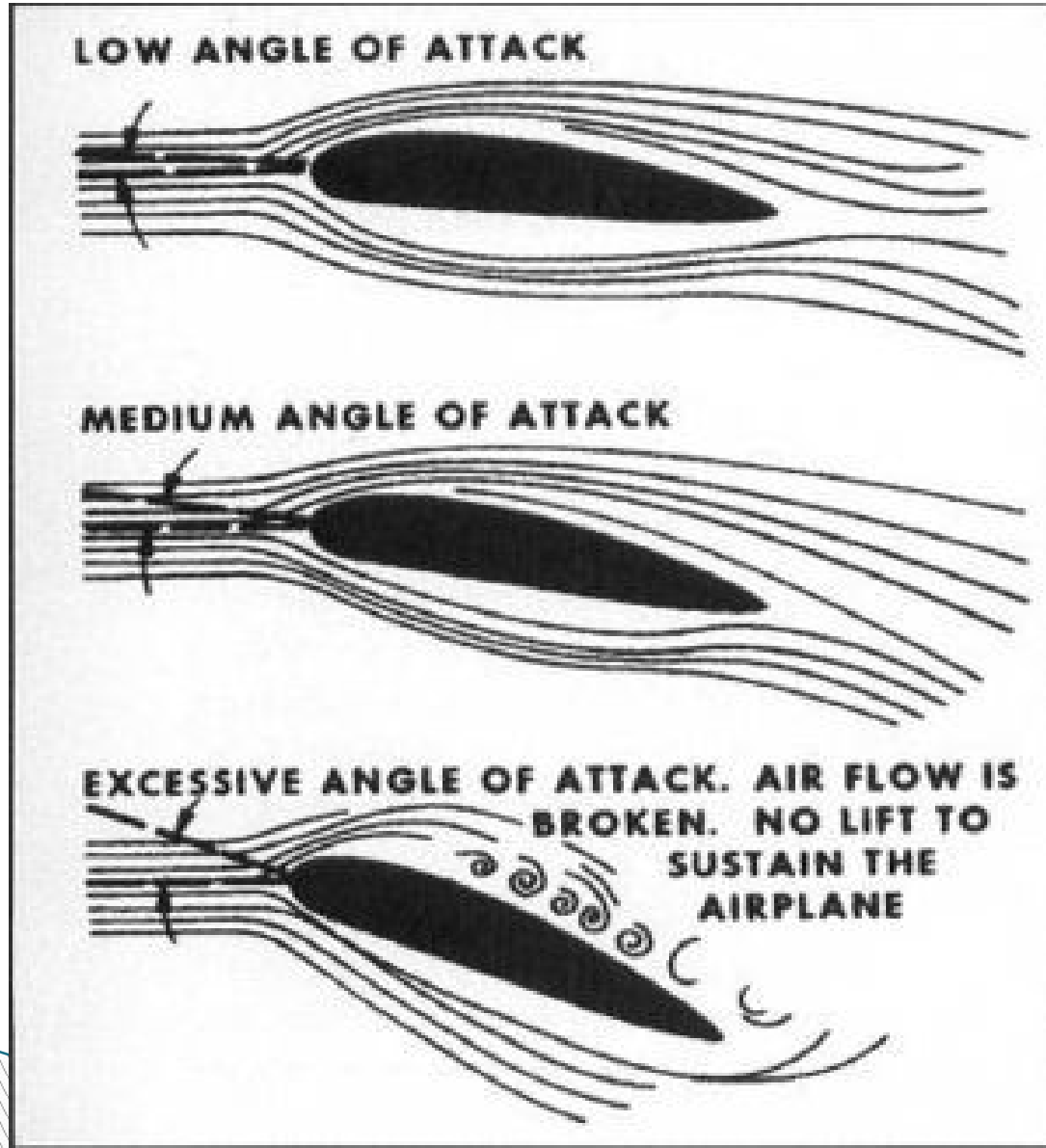


Contents

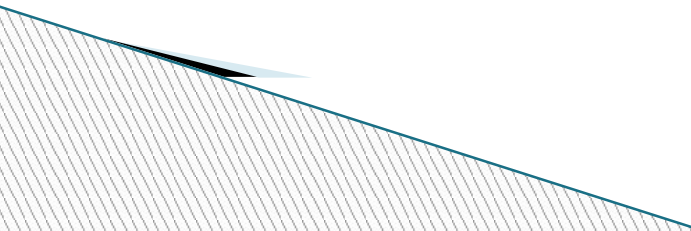
- ▶ Angle of Attack
- ▶ Stall Recognition and Recovery
- ▶ Spin Entry and Recovery
- ▶ Load Limit Considerations
- ▶ Gust Induced Stall and Spin Accidents



Stalls...a stall is a loss of lift when the wing exceeds the critical Angle of Attack

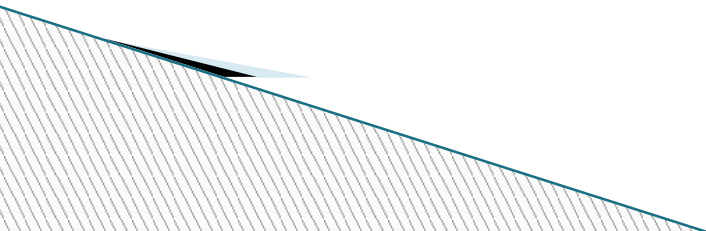


Impending Stall Warnings

- ▶ 1. Excessive back stick pressure
 - ▶ 2. Nose high attitude
 - ▶ 3. Low airspeed
 - ▶ 4. Quietness
 - ▶ 5. Mushy controls
 - ▶ 6. Shudder or buffeting
- ▶ Do all or any of these have to be present for a stall to occur?
- 

Stalls and AoA

- ▶ To stall, we have to exceed the critical AoA
- ▶ How do we do this?
 - ▶ Self induced
 - Pull back on the stick
 - Rolling the aircraft, rising wing at higher AoA
 - ▶ Gust induced
 - Fly into a vertical wind shear
 - Fly through a decreasing wind shear



Gust Induced Stalls

- ▶ <http://www.youtube.com/watch?v=PpJA53LjarM&>

- ▶ S

- ▶ V

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- ▶ V

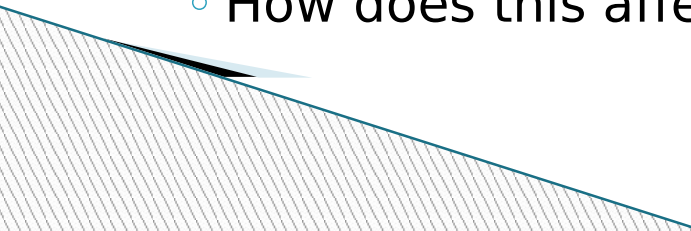


Factors affecting Stall Recovery

- ▶ Weight
 - ▶ Density Altitude
 - ▶ Bank Angle
 - ▶ Load Factor at Stall

 - ▶ Higher of any of these means more altitude to recover

 - ▶ What is your recovery technique?

 - ▶ Pilot Situation Awareness-Tired? Dehydrated?
 - How does this affect recovery?
- 

Factors affecting Turn to Final



▶ <http://www.youtube.com/watch?v=zfFGN-3Yglo&feature=related>

Factors affecting Turn to Final

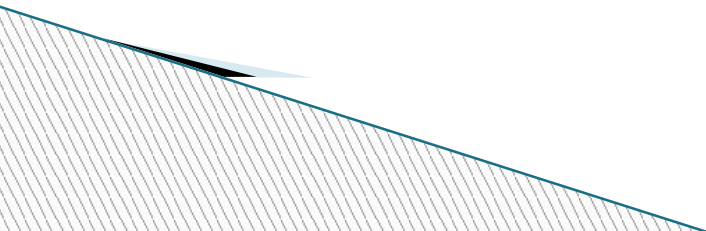
- ▶ Airspeed
- ▶ Skidding Turn..Using the Rudder to Turn
- ▶ Overshooting Crosswind
- ▶ Altitude
- ▶ Too Close Abeam
- ▶ Configuration...Spoilers/Flaps

□ How do these factors affect the inadvertent stall recovery?



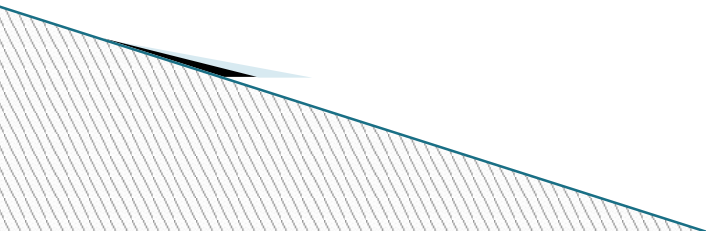
Intentional Stalls

- ▶ Training
- ▶ Straight
 - Simulate long slow deceleration
 - Steep nose high
 - Recover to straight flight
- ▶ Turning
 - Simulate thermalling
 - Simulate turn to final
 - Recover in turn or straight?



Unintentional Stalls

- ▶ When do they occur?
 - Thermal
 - Low Altitude
- ▶ Recovery Technique
 - Break AoA
 - Rudder to pick up wing
 - Ailerons neutral
- ▶



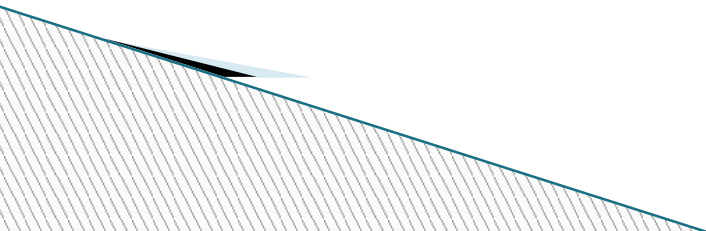
Spins

**Perception
vs reality**



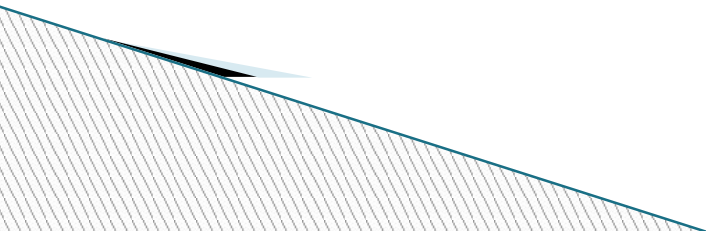
Spins

- ▶ 1. During a spin the aircraft is rolling, yawing, and pitching...therefore it very disorienting.
- ▶ 2. To spin, you must have a stall condition and yaw. Eliminate either and you will not spin.
- ▶ 3. Spin Recovery=Yaw against rotation, release back pressure to break AOA, ailerons neutral.



Three elements of a spin

- ▶ Pitch
 - After the initial stall, glider pitches forward
- ▶ Yaw
 - Initial yaw can be rudder input or adverse yaw
- ▶ Roll
 - Glider begins to roll because one wing is more stalled than the other
 - All this leads to
- ▶ Auto-rotation
 - Wing that is more stalled has more drag, yawing glider toward descending wing and continuing to roll toward the more stalled wing



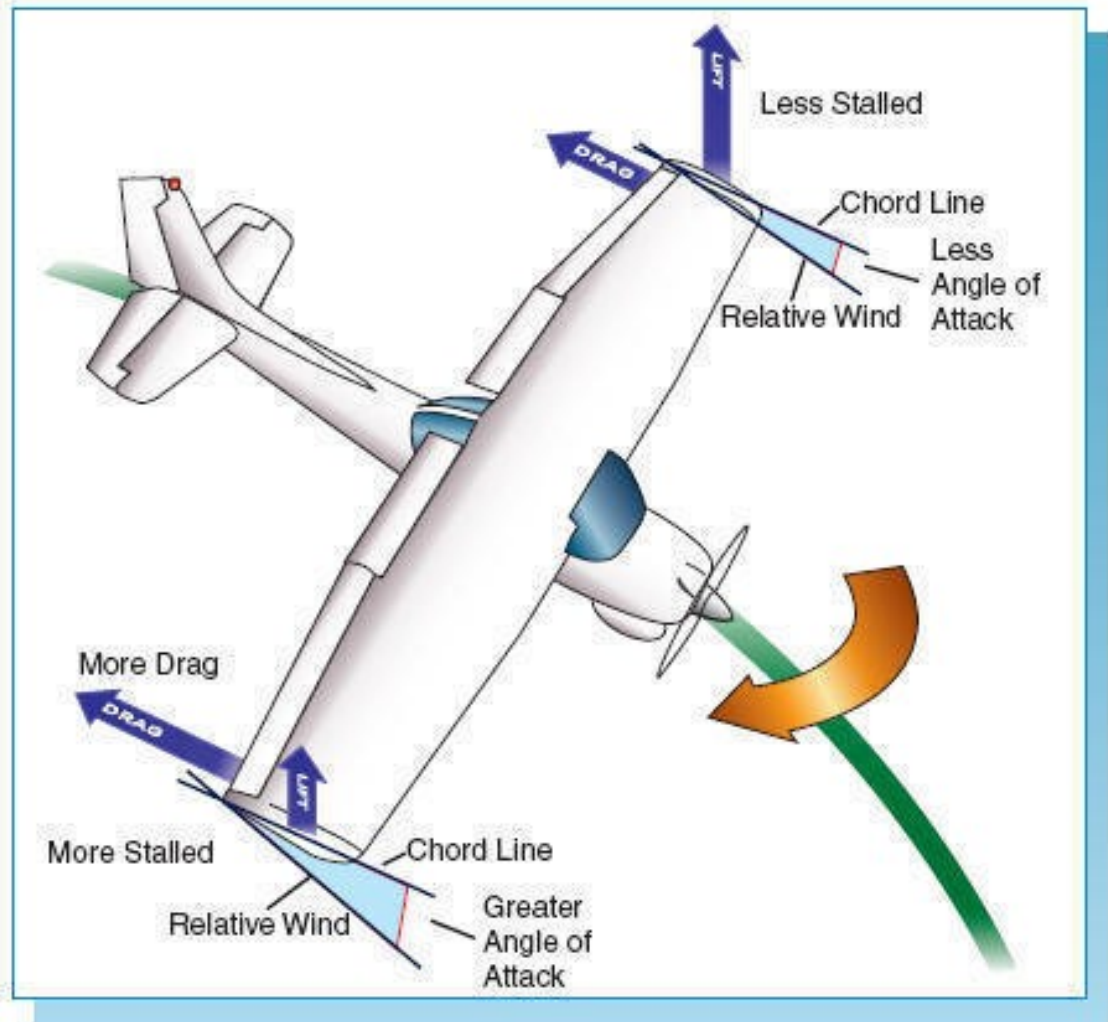
Three elements of a spin



- ▶ <http://www.youtube.com/watch?v=ORQOsxElgnQ>

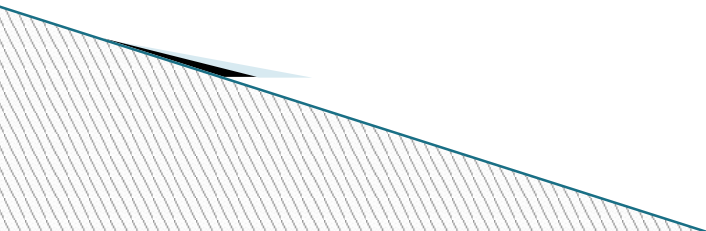
What is a spin?

Stall + Yaw
=
Autorotation

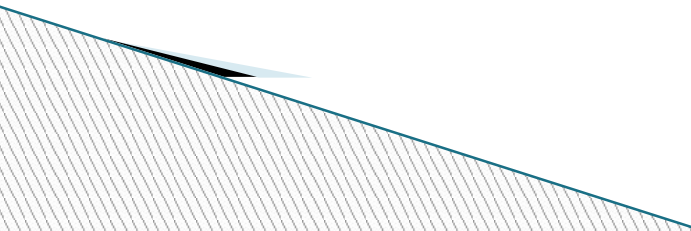


Why Do Pilots Avoid Spin Training?

- ▶ 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

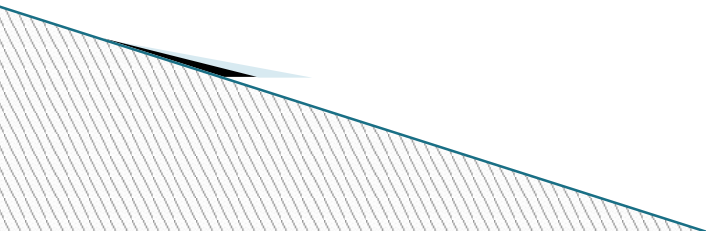


FAA Guidance

- ▶ **Subject: STALL AND SPIN AWARENESS TRAINING**
 - ▶ **Date: 9/25/00**
 - ▶ **AC No: 61-67C**
- 

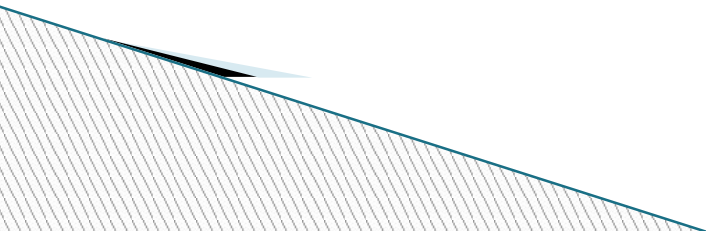
Stall Spin Recognition/Recovery

- ▶ Pilot factors
 - Fatigue
 - Hunger
 - Thirst
- ▶ Aircraft Specific
 - Sudden vs Mush stall
- ▶ When do they happen?
 - Thermals, Final, Low Altitude
- ▶ Are you ready?



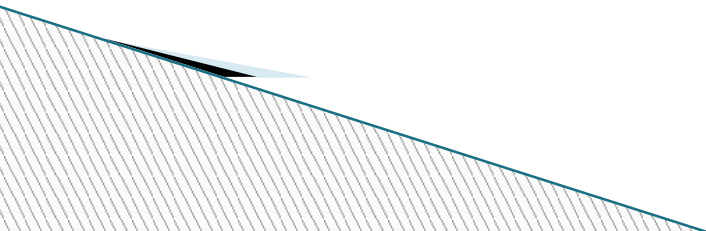
Scenario

- ▶ Problem
 - Low altitude thermaling
- ▶ Themes
 - Gust induced stall
 - Pilot induced by looking outside of turn
 - Distraction caused by radio chatter



Scenario

- ▶ The pilot has been on a local flight and had gotten about 6 miles from the gliderport. While attempting to glide back the pilot encounters a thermal at 300 ft AGL. After completing 1 turn the pilot looks up and to the outside of the turn after noticing some motion.



Scenario Analysis

List 2 Pilot factors

- Desire to get home

- Skill level in thermalling

List 2 Aircraft factors

- Glide ratio of glider

- Instrumentation

List 2 enVironment factors

- Wind speed & direction

- Time of day

List 2 External factors

- No retrieve crew or vehicle

- Spouse has plans for this evening

