Certified Flight Instructor SPIN Training Ground School

Why Are We Here?

A.45 **Spin training: § 61.183(i)(1).** The spin training endorsement is only required of flight instructor airplane and flight instructor glider applicants.

I certify that [First name, MI, Last name] has received the required training of § 61.183(i) in [an airplane, a glider]. I have determined that [he or she] is competent and possesses instructional proficiency in stall awareness, spin entry, spins, and spin recovery procedures.

Who am I?

Lt Colonel Tom Rogers, USAF Ret, 25 years

Captain Tom, Alaska Airlines Ret with 31 years flying B727, B737

Became a CFI in 1976, 3000+ hours of instructing In Military and GA

Primary Military Master Instructor with over 3000 Spins logged

CFI in Floatplanes

CFI with Olde Thyme Aviation, Bremerton WA (KPWT)

- Tail Wheel Endorsements
- Upset Prevention and Recovery
- CFI Candidate Spin Training
- Basic Aerobatics

24,200 Plus Hours in 49 years of flying

NAFI Master

Course Outline

INTRODUCTION

- History of Spin Training

MAIN TOPICS

- Basic Aerodynamics as it relates to Stalls and Spins
- Philosophy of Avoid, Recognize, Recover
- How to AVOID Spins
- How to RECOGNIZE entry to spin
- How to RECOVER from Spin
- Managing Startle and Fear

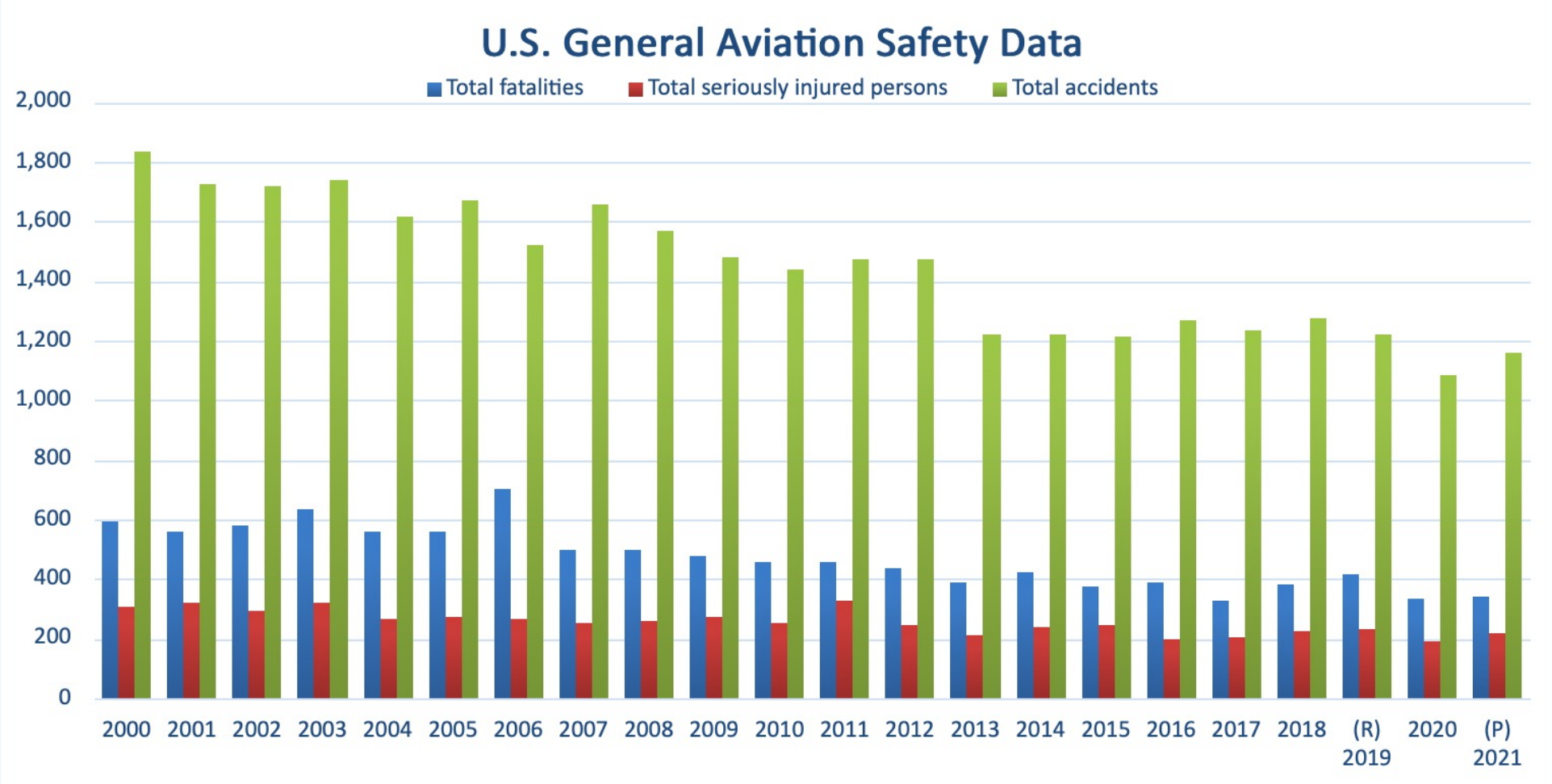
SUMMARY

- Putting it all together and Simple Steps to Recovery

History of Spin Training

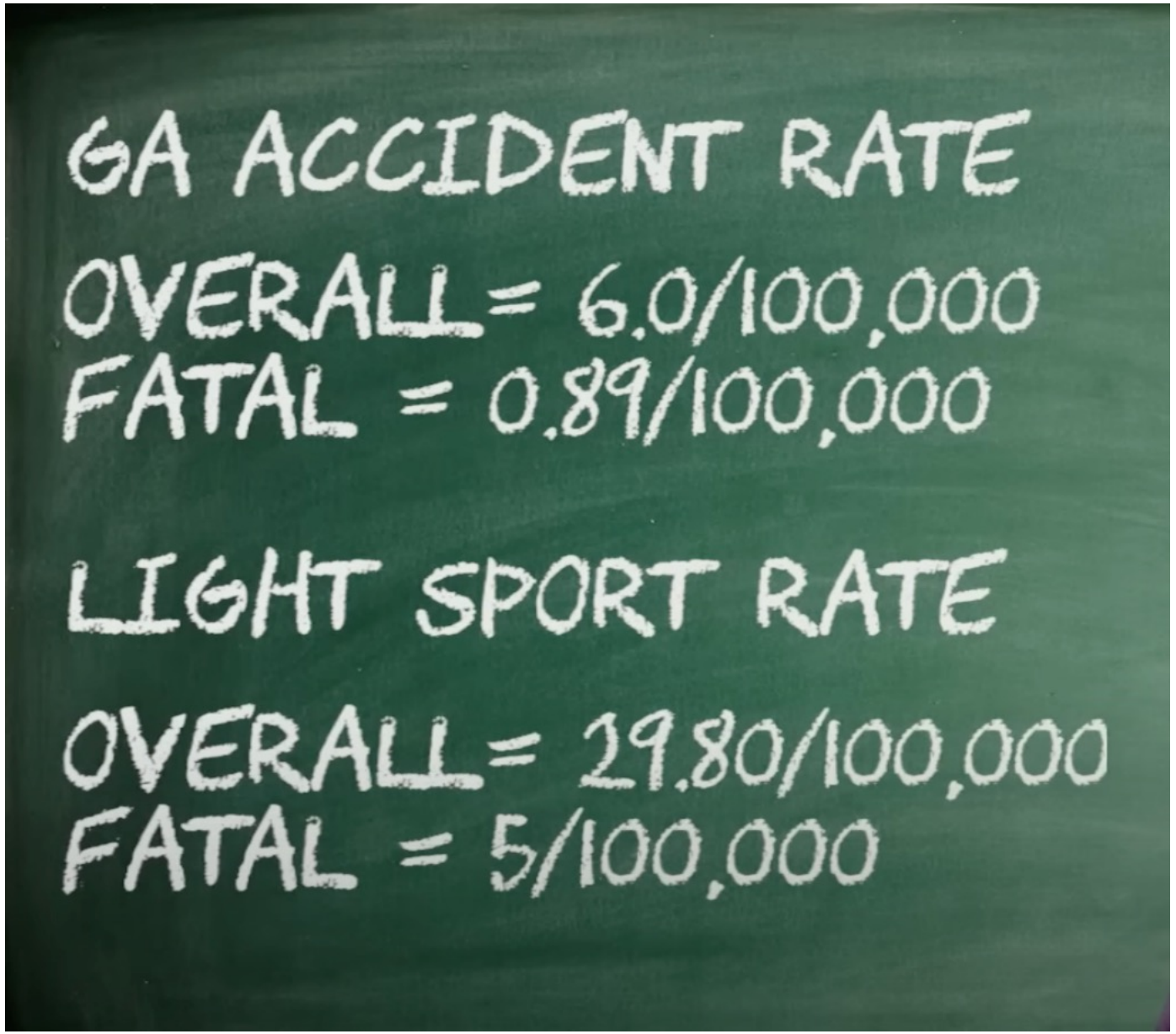
- Required for PPL up to 1954.
- Spin Accident fell from 1955 to 1990s Then remained steady
- LOC Is most common accident in GA
  - Stall/Spin In traffic pattern Most common LOC accident.
  - Last 20 Years, Average 52 to 53 per year.
  - 1 A week in US

General Aviation accident rates not including Part 135



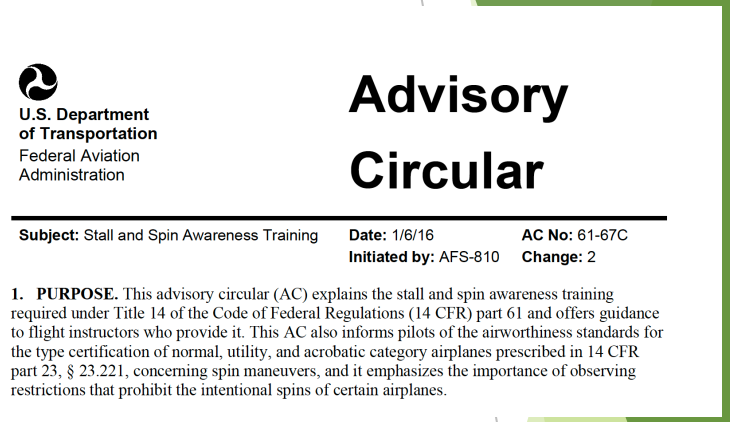
General Aviation is at about 6 per 100,000 hours

LOC are 68% of Accidents In US, Stall/Spins in traffic Pattern are most common LOC accident


GA ACCIDENT RATE
OVERALL= 6.0/100,000
FATAL = 0.89/100,000
LIGHT SPORT RATE
OVERALL= 29.80/100,000
FATAL = 5/100,000

Loss of Control (LOC)

- LOC is the unintended departure from Controlled flight.
- LOC is the leading cause of fatalities in all sectors of aviation.
- FAA safety believes proficiency in all aspects of operations is key to avoid LOC.
  - Indeed it is, but what do you do when things go wrong?
- Most common causes of LOC
  - Unintended flight into IMC
  - Inadvertent stall/spin in traffic pattern
  - Low altitude maneuvering
  - Wake Turbulence
  - Distraction and loss of SA
    - System malfunction
    - Automation confusion

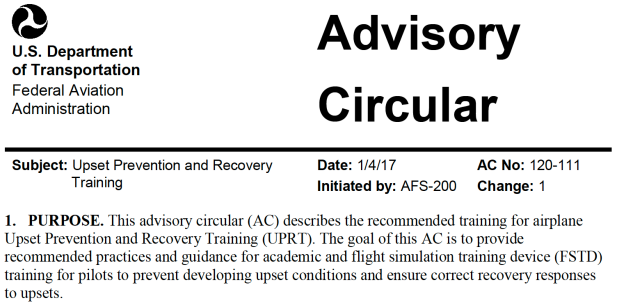


U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Stall and Spin Awareness Training | **Date:** 1/6/16 | **AC No:** 61-67C
Initiated by: AFS-810 | **Change:** 2

1. PURPOSE. This advisory circular (AC) explains the stall and spin awareness training required under Title 14 of the Code of Federal Regulations (14 CFR) part 61 and offers guidance to flight instructors who provide it. This AC also informs pilots of the airworthiness standards for the type certification of normal, utility, and acrobatic category airplanes prescribed in 14 CFR part 23, § 23.221, concerning spin maneuvers, and it emphasizes the importance of observing restrictions that prohibit the intentional spins of certain airplanes.

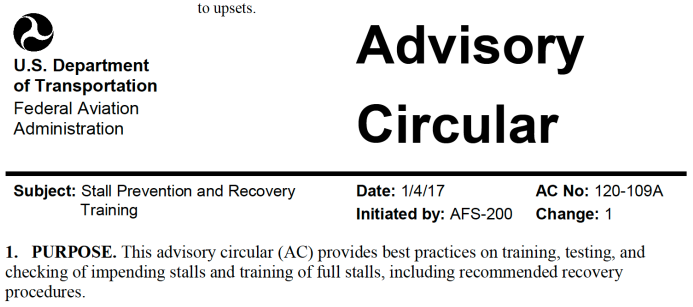


U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Upset Prevention and Recovery Training | **Date:** 1/4/17 | **AC No:** 120-111
Initiated by: AFS-200 | **Change:** 1

1. PURPOSE. This advisory circular (AC) describes the recommended training for airplane Upset Prevention and Recovery Training (UPRT). The goal of this AC is to provide recommended practices and guidance for academic and flight simulation training device (FSTD) training for pilots to prevent developing upset conditions and ensure correct recovery responses to upsets.



U.S. Department of Transportation
Federal Aviation Administration

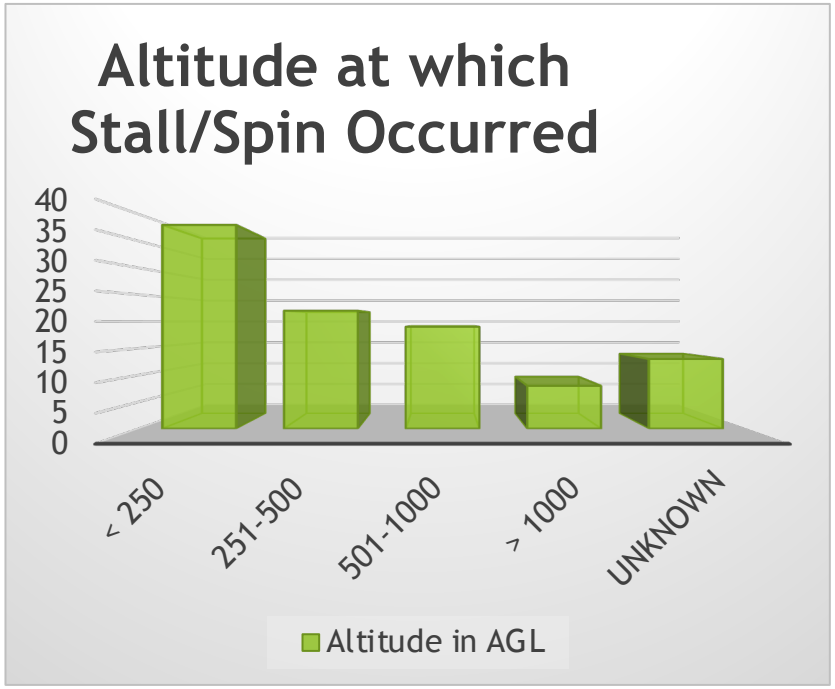
Advisory Circular

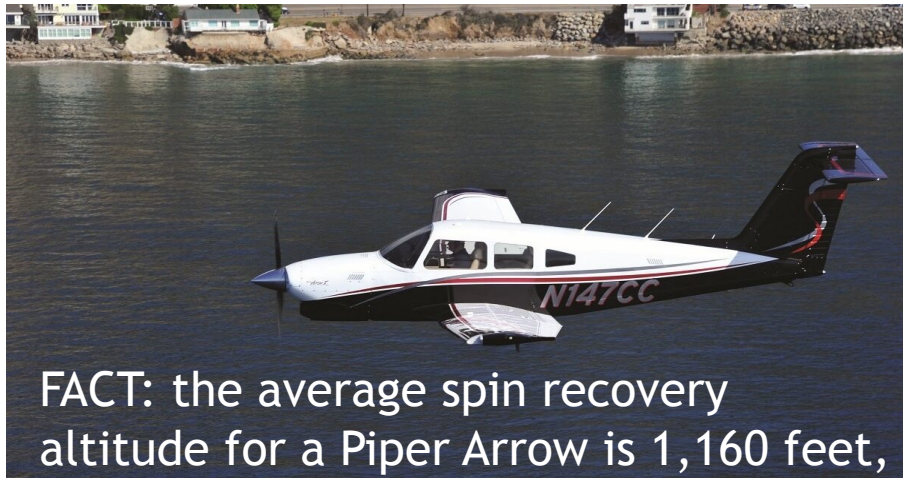
Subject: Stall Prevention and Recovery Training | **Date:** 1/4/17 | **AC No:** 120-109A
Initiated by: AFS-200 | **Change:** 1

1. PURPOSE. This advisory circular (AC) provides best practices on training, testing, and checking of impending stalls and training of full stalls, including recommended recovery procedures.

Loss of Control begins with an Upset

- Alarming Stats?



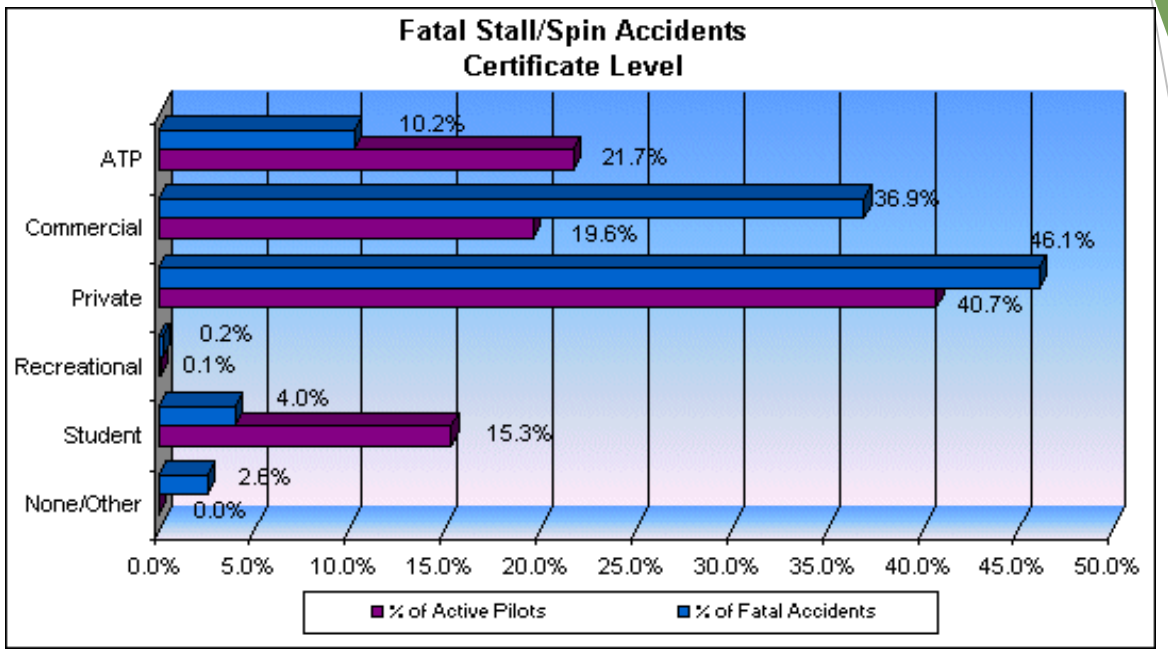


FACT: the average spin recovery altitude for a Piper Arrow is 1,160 feet, Greater than standard traffic pattern altitude.

80% of Stall Spin Accidents occur below 1000 feet AGL. (13% are unknown but probably low as well)

- **Prevention** is the MOST reliable strategy for upsets. The training is called Upset Prevention and Recovery Training.

Just who is having trouble with Stalls?



ACCIDENT ANALYSIS

AOPA AIR SAFETY INSTITUTE

STALL/SPIN: ENTRY POINT FOR CRASH AND BURN?

Stall/spin myths exploded

Pilots who believe that aerobatic training will enable a recovery from an inadvertent spin in the traffic pattern are fooling themselves. That myth - and other misconceptions about stalls and spins in GA aircraft - is exploded in this new ASF study. This study is not intended to discount the value of properly conducted aerobatic and spin training. Training in a controlled environment with a trained instructor is beneficial. The most important aspect of the training should be recognition and prevention.

This again, is how to land an aircraft in a SPIN

Course Outline

INTRODUCTION

- History of Spin Training

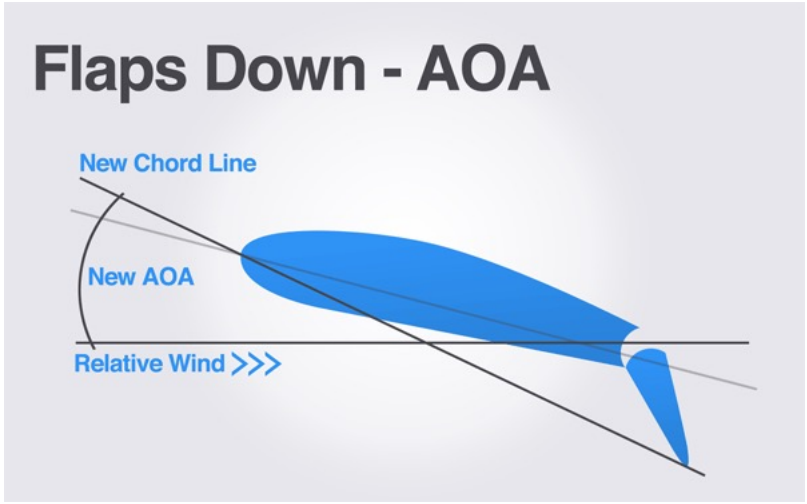
MAIN TOPICS

- Basic Aerodynamics as it relates to Stalls and Spins
- Philosophy of Avoid, Recognize, Recover
- How to AVOID Spins
- How to RECOGNIZE entry to spin
- How to RECOVER from Spin
- Managing Startle and Fear

SUMMARY

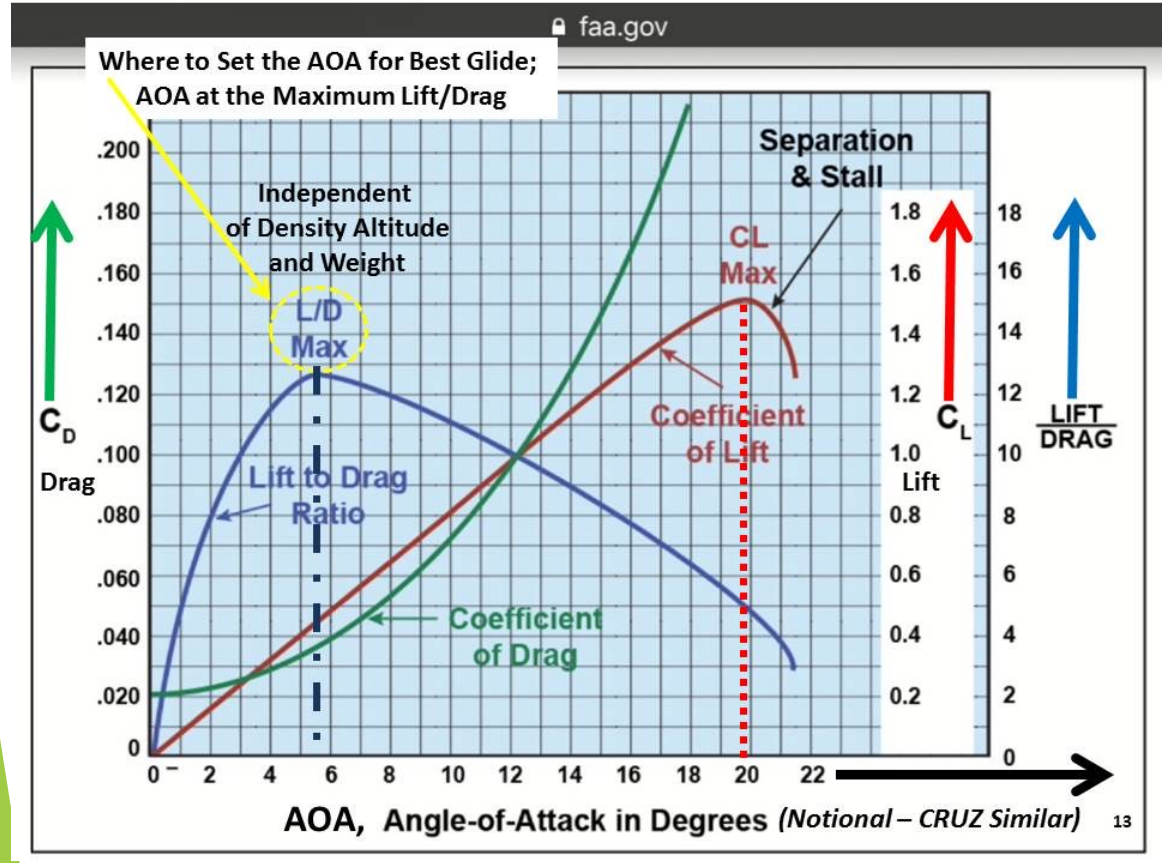
- Putting it all together and Simplifying Flight Upset Recovery

Aerodynamics Relating to Spins



- Angle of Attack (AoA) is the difference or angle between the relative wind and the cord of the aircraft wing. The higher that angle gets the more you will disrupt the airflow over and under the wing.
  - Aircraft wings may stall at any attitude or any airspeed!
  - Cord is simply the straight line between the leading edge and the trailing edge.
  - Flaps and Ailerons change the CORD. Deflected down increases the AoA. Deflecting the Aileron up Decreases wing tip AoA.
- Increase AoA, Lift increases until reaching Critical AoA
  - Lift and back pressure (up Elevator) turns the aircraft, not ailerons.

Aerodynamics Relating to Spins



Once the Critical AoA is reached the wing is stalled (Red Line CL Max)

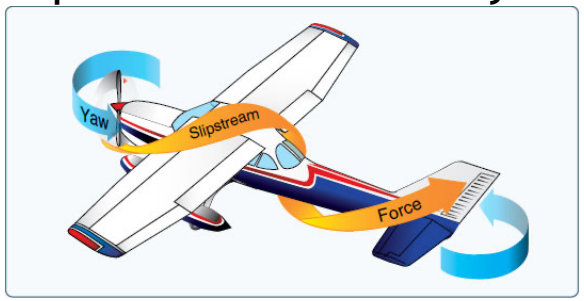
- Note the Chart, Lift continues beyond Critical AoA
- The wing root stalls first causing aerodynamic buffet in most GA aircraft
  - Wing Dihedral roll dampening ceases at critical AoA
  - Sweptwing aircraft stall wing tip first.
- Once the stall progresses to the wing tip ailerons are ineffective
  - Passed Critical AoA ailerons work opposite.
- If aircraft is yawed allows one wing to be in a greater stalled state than the other wing.


2017 TALKEETNA FLY IN
TALKEETNA, ALASKA
Subscribe

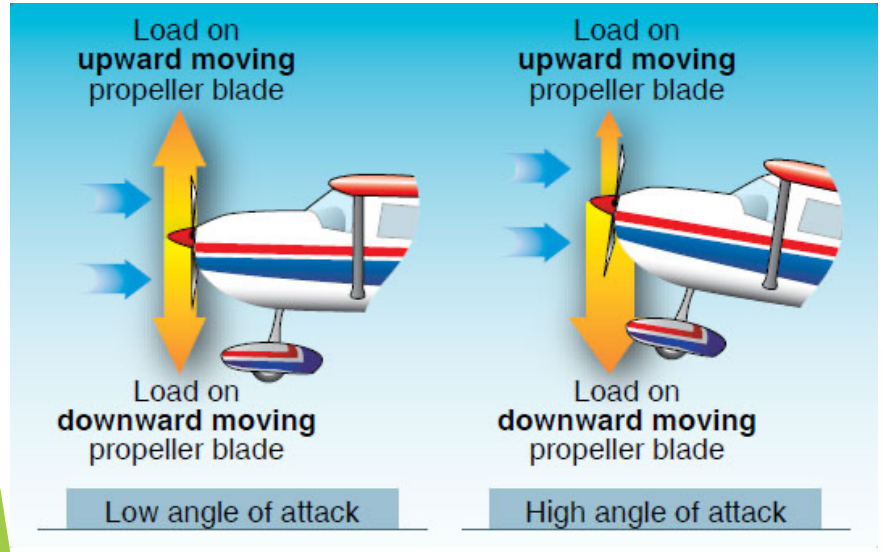
Aerodynamics Relating to Spins

4 Big Left Turn Inducing effects:
P Factor, Gyroscopic Precession, Torque, and Yaw

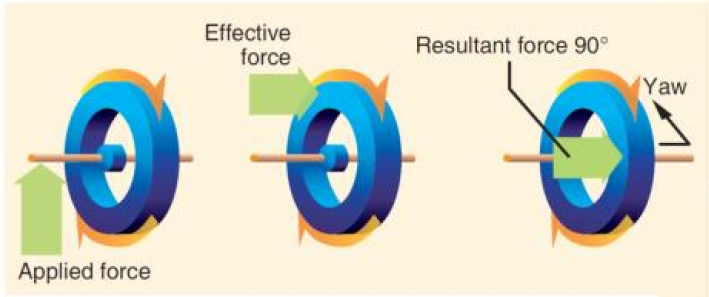
Slipstream causes left yaw

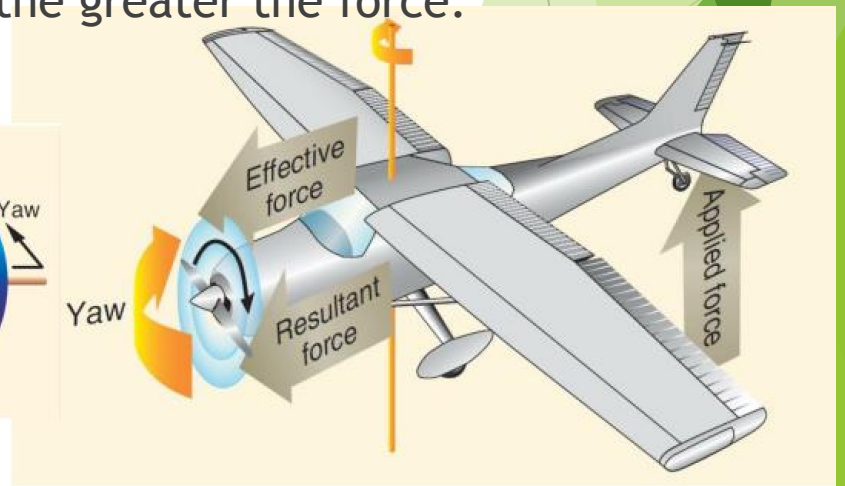


- Engines turn Props clockwise.
  - Downward prop is at greater AoA nose high
  - Yaw to left, apply right rudder



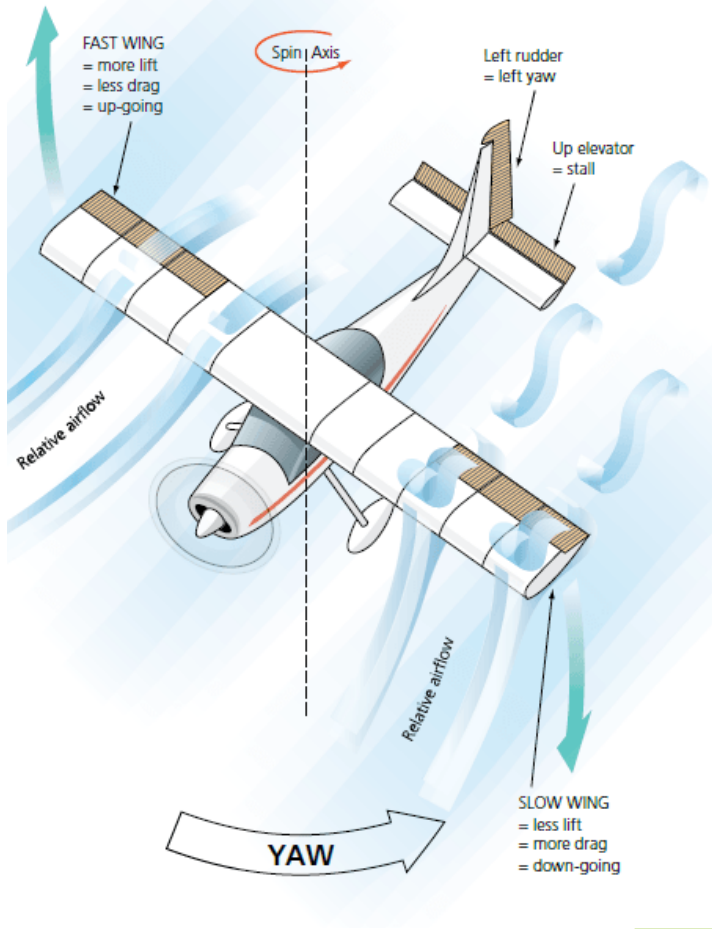
- Gyro Precession means that the force acts 90 degrees to where it was applied.
  - Left turning when pitching down and right when pitching up
  - The faster the motion the greater the force.





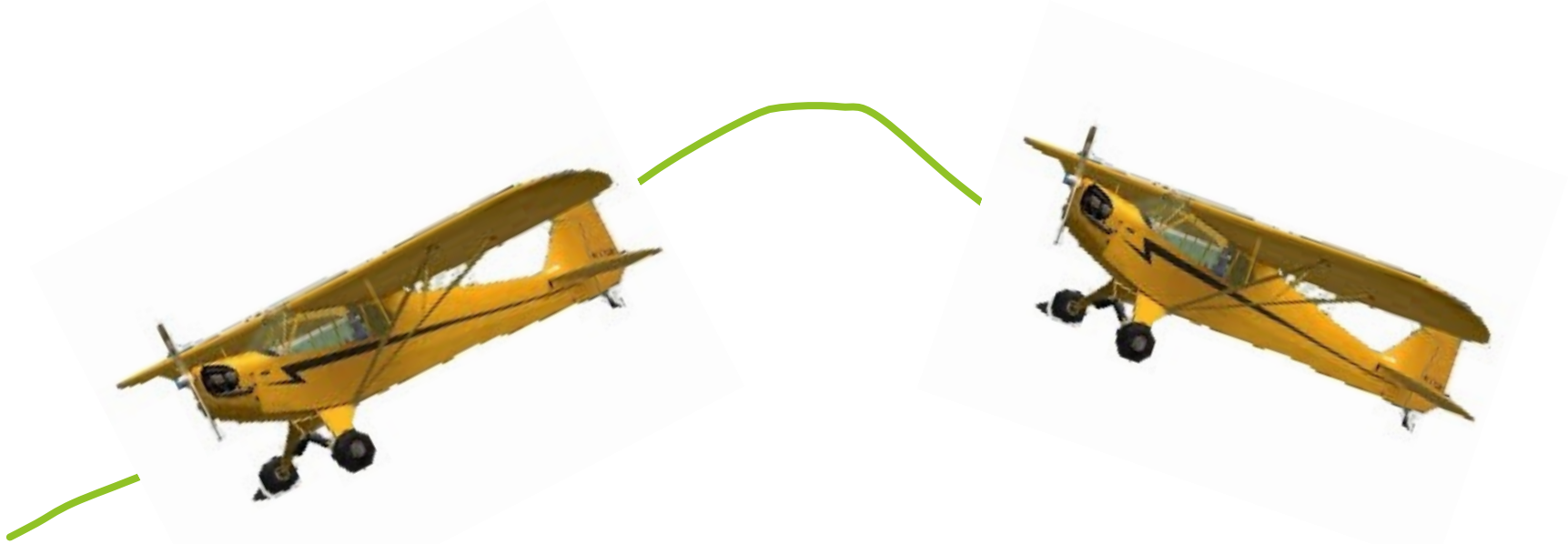
Aerodynamics Relating to Spin

- The aircraft needs TWO things to Spin:
  - Stall
  - Yaw, Yaw allows one wing to reach critical AoA before the other.
  - Without both, you will not spin, but there is always a but, it doesn't take much yaw.
- The aircraft will not stall at zero g! Ever, Honest.
  - If you “unload” or move the control forward to cause zero g, you make it weightless. What is the opposite of lift?
  - Therefore, with no lift and no weight the wing can not reach the critical AoA
  - Also, the opposite of Thrust is Drag. With no weight at zero g you get great acceleration. Zoom Zoom.



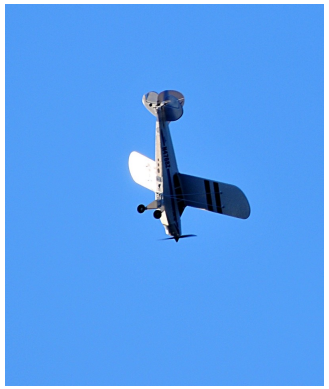
Aerodynamics Relating to Spin

- Rogers' law of Ballistics: Aircraft won't stall at zero g. However, "T" (Time) is finite and T at 0g equals H or height above terra-firma divided by the force of g.



- We will discuss the "Ballistic Method" later, but it is a PREVENTION step used to stop Stalls and Spins. In a word "Unloading".

Philosophy



- AVOID
  - Both Stall and Yaw are needed. Eliminate one and you avoid the Spin.
- RECOGNIZE
  - Recognize neutralize, input prevention controls.
- RECOVER
  - Neutralize controls, opposite rudder, break the stall, recover from the dive.

Avoid

- The Stall Spin Recovery begins with Prevention
  - Stalls, timely recognition and prevention
  - Spins, staying coordinated, not letting stall progress
    - First Use Stall recovery.
    - UNLOAD; Use ballistic method to prevent stall from increasing into spin.
      - You will lose altitude but less than a spin recovery
- Problem Areas for Stalls and Spins
  - Departure Stalls
  - Base to Final Turn

Avoid-Two Problem Areas

Departure Stalls

- Overloading, Weight & Balance issues
- High Density Altitude issues
- Go Arounds

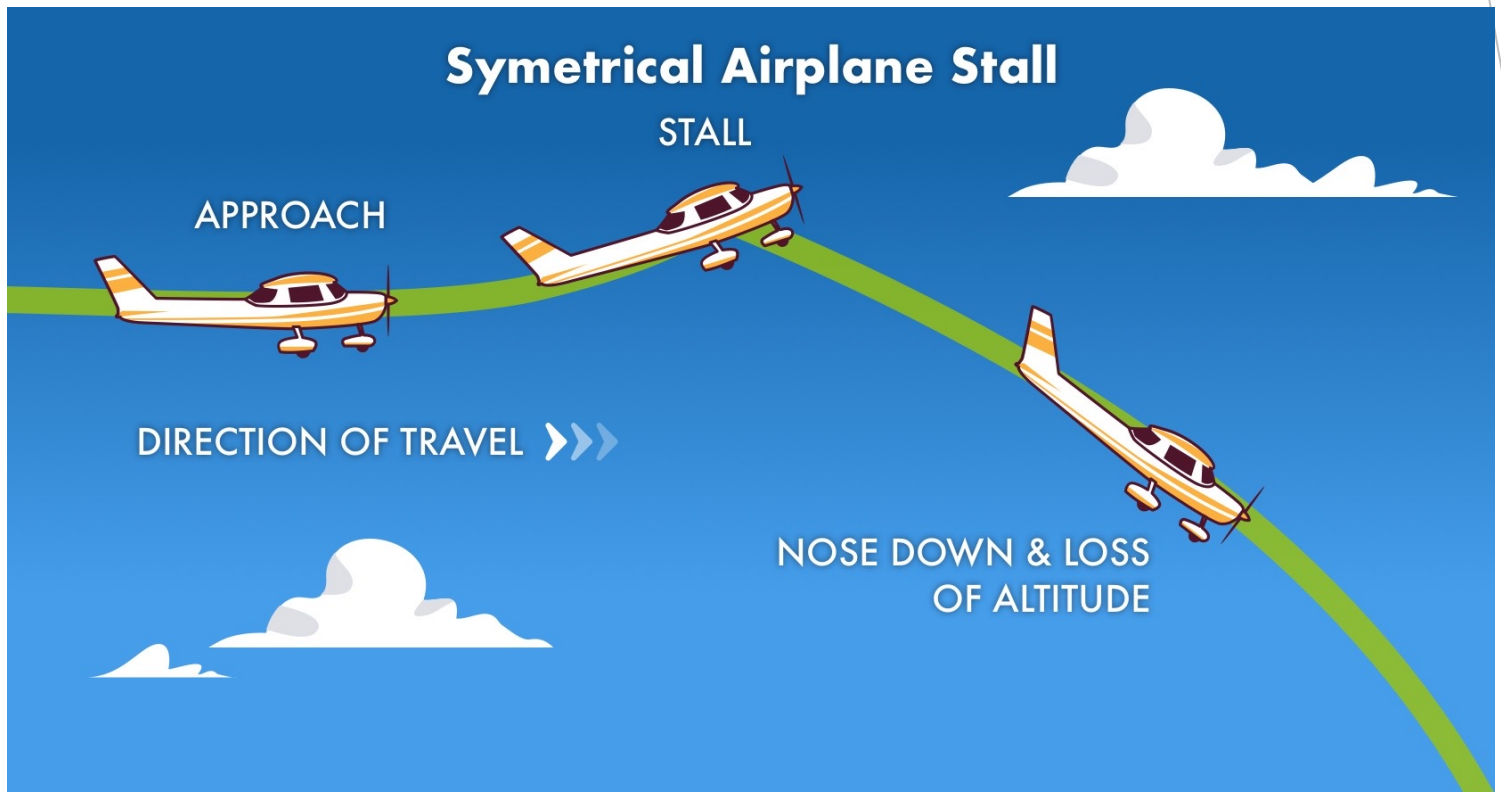
Base To Final Turns

- Starts with crosswind
- Overshooting Final
- Fail to GA
- Skidded Turn, Turns aircraft into swept wing fighter
- Wing stalls first rolling the aircraft upside down.

Recognize

- We know what normal is don't we?
  - When inputting controls and the aircraft does not respond
  - Airspeed stabilizes at low speed and the needle and ball are pegged in one direction.
- Simple solutions are the only ones you will remember or be able to implement.
  - **Prevention** can save more lives than well executed recoveries!

Recovery



- Stall
  - Release backpressure. “Unload” the aircraft.
  - **Counter roll with rudder opposite roll, NOT Ailerons**
  - Use ailerons only after stall broke, then to level wings.
  - Recover from the dive.

Recovery

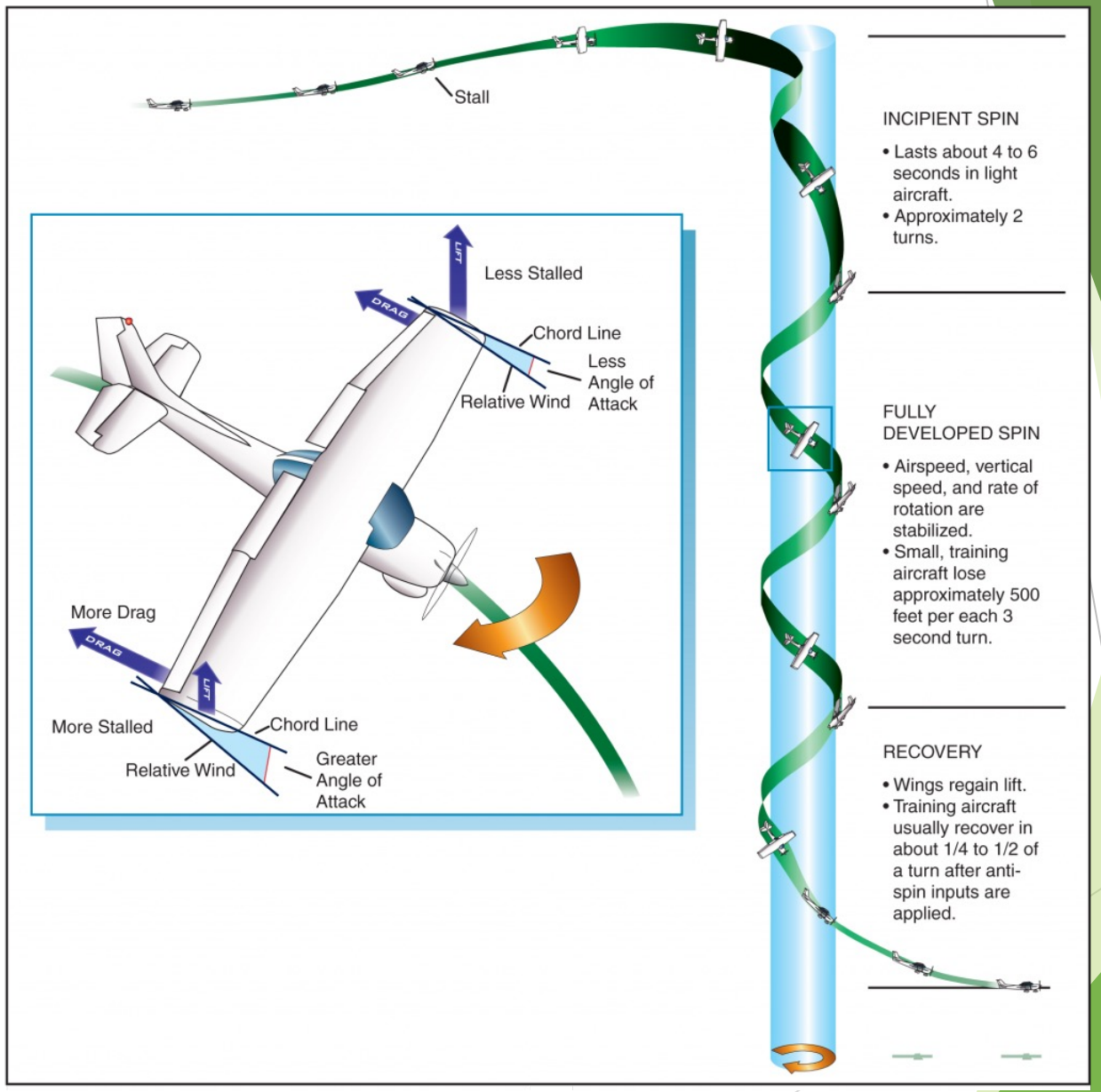
- Spin - P.A.R.E.D.
  - Power - idle
  - Ailerons - neutral

  Note 1: Most spin entries in GA you will have the stick/control wheel full aft to enter the spin. This recovery will work even if not full aft. **However holding the control full aft while holding ailerons neutral will slow the spin rate.**

  - Rudder - full opposite the spin. If you can't tell look at turn needle (or airplane)

    "Needle left, spinning left = Right rudder"

  - Stick or control wheel (Elevator) - forward until the spin stops
  - Recover from the dive

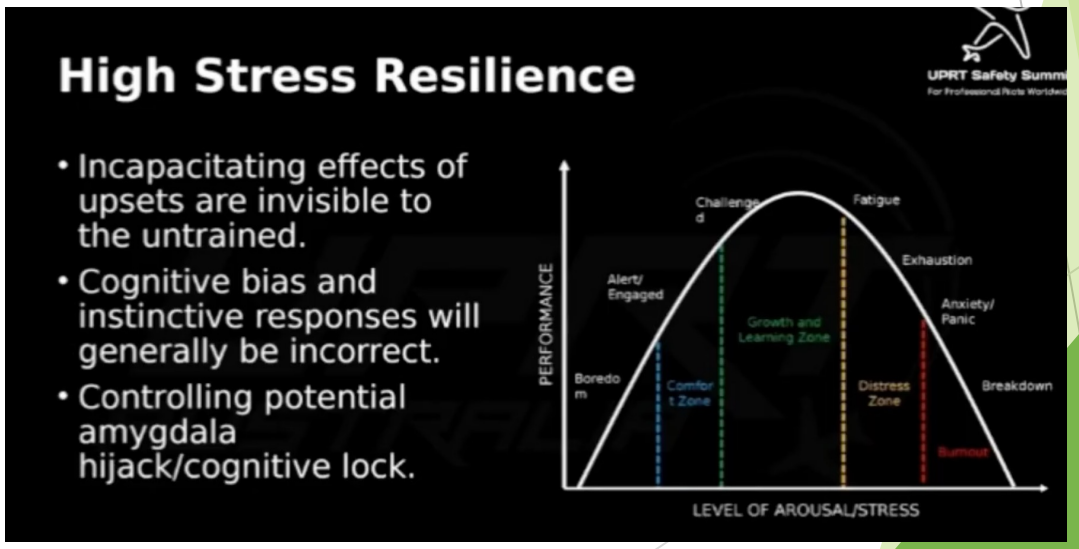


Note 2: This is a standard procedure. The Pilot's Operation Handbook (POH) takes precedence.

Manage Your Emotions

How we CFI's Introduce Stalls Has a lasting impact on students and can last a lifetime in pilots.

There are very real physiological responses to fear. Instinctual responses are WRONG, We need to teach correct responses.



Manage Your Emotions

- First, teach confidence that it can be fixed, and you are going to fix it!
- Startle factor is your mind going through the 5 stages of grief in about 1 second. (**denial**, anger, bargaining, depression and acceptance)
  - Skip to Acceptance and react
  - After you recover the aircraft and are flying again, then you can get excited.
- Greatest fear reducer is experience.
  - If you go into Stall training confident, the Student will learn better.
  - Use of scenarios will give the training relevance.
  - Practice and proficiency will ease the startle factor.

Course Outline

INTRODUCTION

- History of Spin Training

MAIN TOPICS

- Basic Aerodynamics as it relates to Stalls and Spins
- Philosophy of Avoid, Recognize, Recover
- How to AVOID Spins
- How to RECOGNIZE entry to spin
- How to RECOVER from Spin
- Managing Startle and Fear

SUMMARY

- Putting it all together and Simplifying Spin Recovery

Wrapping it ALL up-So to speak

- In a Stall
  - Normal Stall Recovery
  - The ballistic method understanding for emergencies.
- In a Spin
  - P.A.R.E.D

FAAST
FAA SAFETY TEAM

Lesson Complete, Questions?