WILLIAMSON FLYING CLUB
~ Established 1956 ~

FlyThisSim Flight Simulators

Power On/Off Stalls, Spins, Cross Controlled Stalls, Unusual Attitude Recovery

TASK

- Perform Set-Up and Recovery for the Following:
  - Power-ON (Departure) Stall
  - Power-OFF(Arrival) Stall
  - Spin
  - Cross Controlled Stall
- Induce/Recover from Unusual Attitudes with/without Clouds
  - Induce/Recover VFR Unusual Attitude (Close your Eyes and "Play" Around with the Controls)
  - Pause Flight
    - Environment:
      - Clouds: Base=1000ft, Top=5000ft
  - Restart Flight
  - Induce/Recover IFR Unusual Attitude (Close your Eyes and "Play" Around with the Controls)
- Perform IMC Standard Rate Turns, Climbs and Descents

CONDITION

- Airplane: Piper Warrior (Piper_Warrior_FTS530_VisX.lfts)
- Location: KSDC, Williamson-Sodus Airport
- Reposition:
  - Altitude: 3000ft
  - Airspeed: 95 kts
- Environment:
  - Time: 12:00
  - Visibility: VFR (7sm)
  - Clouds: None
  - Wind Direction: 100°
  - Velocity: 0 kts
  - Turbulence: 3

STANDARDS

- Execute Proper Recovery Technique with Minimum Altitude Loss
- Altitude +/- 100ft, Airspeed +/- 5 kts, Heading w/in 10°
- Completes Appropriate Checklist

STEEP TURNS

1) Select altitude (greater than 1,500 agl)
2) Conduct appropriate clearing turns
   a) Turns should total at least 180 deg (2-90deg, 1-180deg or 1-360deg)

3) Aircraft Setup: (Using pre-landing checklist)
   a) Seats & Seat Belts-----LOCKED / FASTENED
   b) Fuel Pump---------------------------------ON
   c) FUEL TANK------------SELECT FULLEST
   d) Mixture---------------------------------RICH
   e) Landing Light (Day & Night)-----------ON

4) Maneuver Entry
   a) Establish appropriate Airspeed: (95kts or 110mph)
      i) Pitch and Trim as necessary
   b) Establish appropriate Heading:
      i) Choose a cardinal heading (N,S,E,W) or Landmark for easy outside reference
   c) Establish 45° bank coordinated 360° turn to the LEFT
      i) As turn progresses through 30° of bank
         (a) Increase pitch as necessary to maintain altitude
      (2) (Using outside visual reference and reference to flight instruments)
         (a) Simultaneously increase power as necessary to maintain airspeed
         (b) Begin roll out approximately 15-20° before desired heading, reducing pitch and power as necessary to maintain altitude and airspeed.
   d) Smoothly transition to RIGHT hand turn as required.
      i) RIGHT Aileron/RIGHT Rudder
      ii) Maintain Visual Reference with the horizon

5) Conduct after takeoff check
   a) Verify--Flaps-UP
   b) Fuel Boost Pump---------OFF (Verify Pressure)
   c) Landing Light--------------------------------------OFF
   d) Engine Instruments-----------------Verify (Green)
   e) Mixture----Lean During Cruise (After Level-Off)
      i) Above 5,000' or at Less Than 75% Power

STEEP TURNS

Objective. To determine that the applicant:

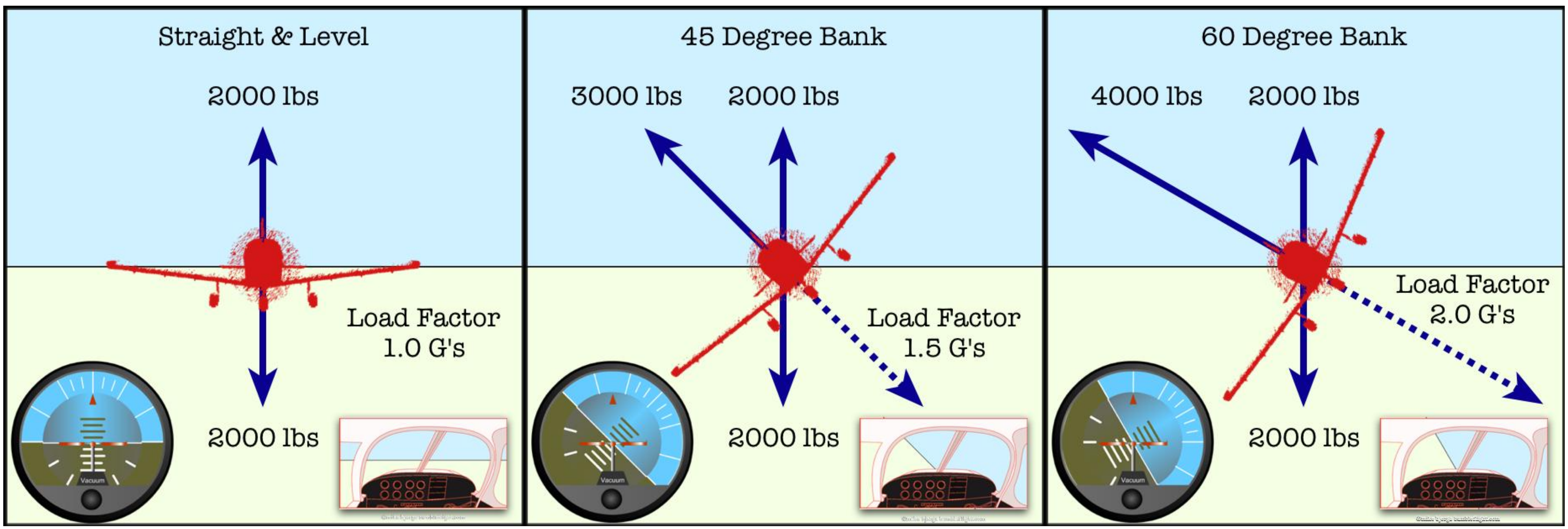
1) Exhibits knowledge of the elements related to steep turns.
2) Establishes the manufacturer's recommended airspeed or if one is not stated, a safe airspeed not to exceed VA.
3) Rolls into a coordinated 360° turn; maintains a 45° bank.
4) Performs the task in the opposite direction, as specified by the examiner.
5) Divides attention between airplane control and orientation.
6) Maintains the entry altitude, ±100 feet (30 meters), airspeed, ±10 knots, bank, ±5°; and rolls out on the entry heading, ±10°.

<u>Common</u> <u>Errors</u>:

1) Improper pitch, bank, and power coordination during entry and rollout
   a) Do not over-anticipate the amount of pitch change needed during entry and rollout.
      i) Smoothly add back pressure as required to maintain level flight.
      ii) As back pressure is applied, add power as required to maintain airspeed.
      iii) Relieve back pressure and reduce power during recovery and/or transition.
2) Uncoordinated use of flight controls.
   a) If the airplane's nose starts to move before the bank starts, rudder is being applied too soon.
   b) If the bank starts before the nose starts turning or if the nose moves in the opposite direction, thr rudder is being used too late.
   c) If the nose moves up or down when entering a bank, excessive or insufficient back elevator pressure is being applied.
3) Improper technique in correcting altitude deviations.
   a) As workload increases, so too must your cross check. Outside visual reference should be supplemented with frequent reference to flight instruments.
   b) When altitude is lost, decrease the bank angle slightly before making pitch adjustments.
   c) Do not use the rudder to attempt to maintain a level flight attitude. Coordinated control with proper pitch and bank adjustments should be used.
4) Failure to adequately clear the area
5) Gaining altitude in right turns and/or losing altitude in left turns.
6) Failure to maintain constant bank angle.
7) Attempting to perform the maneuver by instrument reference rather than visual reference.
8) Failure to scan for other traffic during the maneuver.
9) Loss of orientation or excessive deviation from desired heading during rollout
   a) Use outside visual references (landmarks) to maintain orientation.
   b) Plan a smooth roll out approximately 20 ° prior to the desired heading (1/2 the bank angle).

- Generally speaking, a **Steep Turn** is any turn greater than 30° of bank, not necessary for Normal Flight.
- To change the airplanes direction of flight, we take the Lift Force generated by the wings and tilt it left or right, creating a side force called the **Horizontal Component of Lift**.
- As we Bank the plane, the **Vertical Component of Lift** is reduced, causing the airplane to start going down...
    - You will see the Nose of the plane begin to drop.
    - When we see the Nose "Drop", we should add enough Back Pressure (Nose Up Force) to prevent the Nose from dropping.
- Adding Nose Up Force will tilt the Lift Force rearward, increasing drag and causing a Loss of Airspeed...
- In turns up to 30° of bank, the loss of airspeed is usually less than 10kts and for a basic change of direction, generally considered an acceptable loss requiring no action...
    - The idea here is that the turn will only be momentary, so, to reduce workload, we can allow a slight airspeed loss during the turn.
- As Bank Angle increases (especially beyond 30°), the amount of Nose Up Force required will increase... quickly.
- You will begin to feel the "G"forces as we increase the amount of Lift Force to hold altitude...
    - The loss of airspeed will also increase... quickly...
    - Requiring an increase in Power to prevent an excessive loss of speed.
- So!, as we Roll into Steep Turns, we should anticipate this need for back pressure and as the Nose begins to drop we should **simultaneously Add Back Pressure *AND* Power...**
- Once established in the Steep Turn we should continue to watch the Nose of the Plane and keep it tracking Left or Right and Parallel to the Horizon Line...
- We should also be scanning the Flight Instruments to ensure Bank Angle, Altitude and Airspeed are being maintained...
- Once the need for a change is recognized: **Look out Front, make *incremental* changes to the Pitch, Bank or Power as necessary....**

CRANK--YANK--POWER--CROSSCHECK!



POWER-ON STALLS

1) Select altitude (greater than 1,500 agl)
2) Conduct appropriate clearing turns
   a) Turns should total at least 180 deg (2-90deg, 1-180deg or 1-360deg)

3) Aircraft Setup: (Using "Takeoff" Checklist)
   a) Controls---------------Free
   b) Fuel--------------------On Proper Tank
   c) Fuel Pump-----------On
   d) Carb Heat -----------Off
   e) Mixture ---------------Rich
   f) Tab -------------------Set (For Takeoff)
   g) Flaps -----------------Set

4) Maneuver Entry
   a) Choose a cardinal heading (N,S,E,W) for easy outside reference
   b) Establish <u>Climb</u> in Desired Takeoff Configuration
      i) <u>"Normal" (No-Flaps)</u>
         (1) →Airspeed: Vr—55 kts
         (2) →Power: Full
      ii) <u>"Short/Soft" (Flaps—25deg "Two Notches")</u>
         (1) →Flaps incrementally extended to 25 degrees
         (2) →Airspeed: Vr—55 kts
         (3) →Power: Full
   c) Establish Turn as Desired: Up to 20 degrees of bank
   d) Pitch for an attitude that will induce a stall.
   e) Announce stall warning indications as they occur
      i) Loss of control effectiveness
      ii) Stall warning light (or horn)
      iii) Buffeting

5) Maneuver Recovery (After stall occurs)
      i) Simultaneously:
   b) Pitch to reduce angle of attack (as necessary to Break the Stall)
   c) Verify Full Power: Full Throttle; Full Rich Mixture; Carb-Heat Off
      i) →At Full Power: Decrease Flaps to 2nd Notch if extended
   d) Level the Wings and Establish Vy pitch attitude
      i) →At Vx and Positive Climb Rate: Decrease Flaps to 1st Notch
      ii) →At Vy: Decrease Flaps to Zero
   e) Return to Maneuver Altitude and Cruise Airspeed

6) Conduct After Takeoff Check
   a) Verify--Flaps-UP
   b) Fuel Boost Pump---------OFF (Verify Pressure)
   c) Landing Light-------------------------------------OFF
   d) Engine Instruments-----------------Verify (Green)
   e) Mixture----Lean During Cruise (After Level-Off)
      i) Above 5,000' or at Less Than 75% Power

<u>TASK</u>: POWER-ON STALLS

NOTE: In some high performance airplanes, the power setting may have to be reduced below the practical test standards guideline power setting to prevent excessively high pitch attitudes (greater than 30° nose up).

1) Objective. To determine that the applicant:
2) Exhibits knowledge of the elements related to power-on stalls.
3) Selects an entry altitude that allows the task to be completed no lower than 1,500 feet (460 meters) AGL.
4) Establishes the takeoff or departure configuration. Sets power to no less than 65 percent available power.
5) Transitions smoothly from the takeoff or departure attitude to the pitch attitude that will induce a stall.
6) Maintains a specified heading, ±10°, in straight flight; maintains a specified angle of bank not to exceed 20°, ±10°, in turning flight, while inducing the stall.
7) Recognizes and recovers promptly after the stall occurs by simultaneously reducing the angle of attack, increasing power as appropriate, and leveling the wings to return to a straight-and-level flight attitude with a minimum loss of altitude appropriate for the airplane.
8) Retracts the flaps to the recommended setting; retracts the landing gear if retractable, after a positive rate of climb is established.
9) Accelerates to VX or VY speed before the final flap retraction; returns to the altitude, heading, and airspeed specified by the examiner.

<u>Common</u> <u>Errors:</u>

1) Failure to establish the specified configuration.
   a) Set up as if you were just rotating for departure
   b) Pitch and maintain an attitude that will induce a stall..
2) Improper pitch, heading, and bank control
   a) Use visual as well as instrument references to maintain coordinated level or banked flight
   b) Counteract torque effect with the rudder and bank angle as necessary with the ailerons.
3) Rough or uncoordinated control technique.
   a) Maintain SMOOTH (not jerky) control application at all times.
   b) Keep the airplane in coordinated flight.
4) Failure to recognize the first indications of a stall
5) Failure to achieve a stall
   a) You must maintain sufficient elevator back pressure to induce a stall.
   b) A full stall is evidenced by:
6) Full back elevator pressure
7) High sink rate
8) Nose-down pitching
9) Possible buffeting
10) Improper torque correction: Use right rudder to counter torque effect as airspeed decreases; keep ball centered.
11) Poor stall recognition and delayed recovery
12) Excessive altitude loss or excessive airspeed during recovery
   a) Pitch to break stall, then smoothly adjust pitch to the desired attitude.
13) Secondary stall during recovery
   a) Caused from hastened or incomplete stall recovery

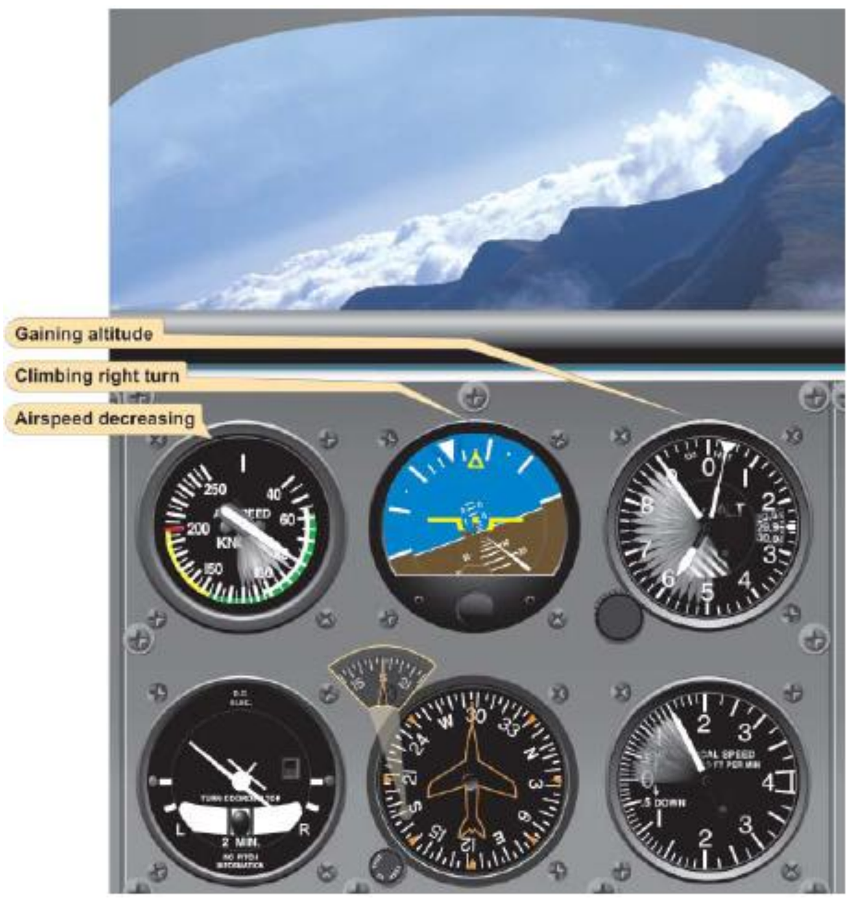
Recovery From Unusual Attitudes:

Recovery from Unusual Attitudes

As soon as the unusual attitude is detected, the recommended recovery procedures stated in the POH/AFM should be initiated. If there are no recommended procedures stated in the POH/AFM, the recovery should be initiated by reference to the ASI, altimeter, VSI, and turn coordinator.

Nose-High Attitudes

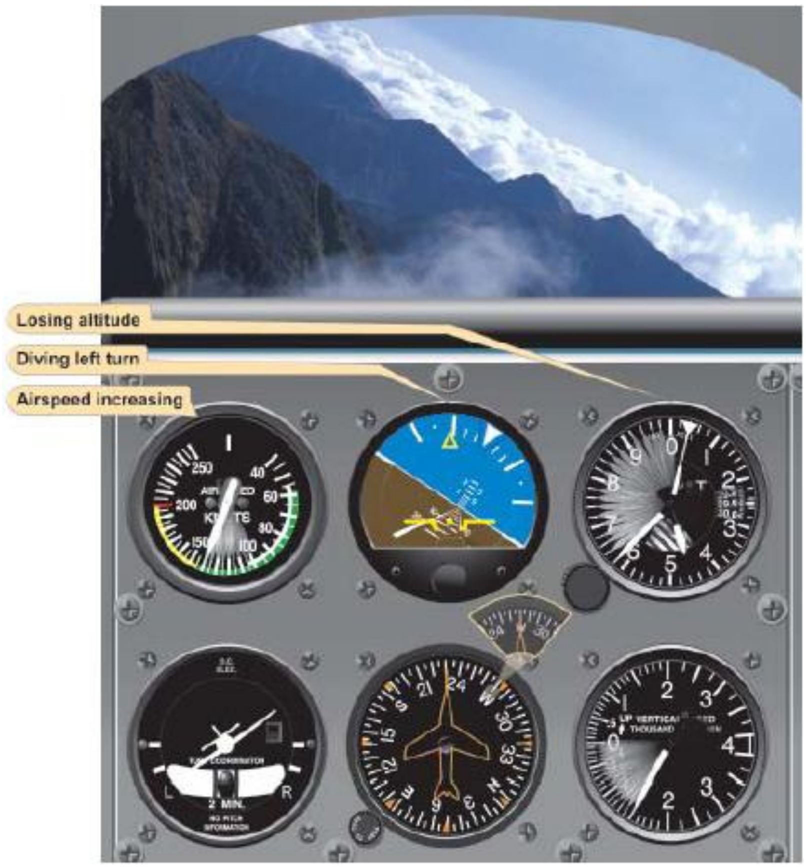
1. If the airspeed is decreasing, or below the desired airspeed, increase power (as necessary in proportion to the observed deceleration), apply forward elevator pressure to lower the nose and prevent a stall, and correct the bank by applying coordinated aileron and rudder pressure to level the miniature aircraft and center the ball of the turn coordinator.
2. The corrective control applications are made almost simultaneously, but in the sequence given above.
3. A level pitch attitude is indicated by the reversal and stabilization of the ASI and altimeter needles.
4. Straight coordinated flight is indicated by the level miniature aircraft and centered ball of the turn coordinator.



Nose high attitude

Nose-Low Attitudes

1. If the airspeed is increasing, or is above the desired airspeed, reduce power to prevent excessive airspeed and loss of altitude.
2. Correct the bank attitude with coordinated aileron and rudder pressure to straight flight by referring to the turn coordinator.
3. Raise the nose to level flight attitude by applying smooth back elevator pressure.



Nose low attitude

POWER-OFF STALLS

1) Select altitude (greater than 1,500 agl)
2) Conduct appropriate clearing turns
   a) Turns should total at least 180 deg (2-90deg, 1-180deg or 1-360deg)
3) Aircraft Setup: (Using Pre-Landing Checklist)
   a) Seats & Seat Belts-----LOCKED / FASTENED
   b) Fuel Pump---------------------------------ON
   c) FUEL TANK------------SELECT FULLEST
   d) Mixture---------------------------------RICH
   e) Landing Light (Day & Night)-----------ON
4) Maneuver Entry
   a) Choose a cardinal heading (N,S,E,W) for easy outside reference
   b) Establish <u>Descent</u> in Desired Landing Configuration
      i) <u>“Clean” (No-Flaps)</u>
         (1) →Airspeed: 75 kts (Established and Trimmed)
         (2) →Power: Idle
      ii) <u>“Approach” (Full-Flaps)</u>
         (1) →Flaps incrementally extended up to 40 degrees
         (2) →Airspeed: 65 kts (Established and Trimmed)
         (3) →Power: 1200-1500 rpm
   c) Establish Turn as Desired: Up to 20 degrees of bank
   d) Pitch for an attitude that will induce a stall.
   e) Announce stall warning indications as they occur
      i) Loss of control effectiveness
      ii) Stall warning light (or horn)
      iii) Buffeting
5) Maneuver Recovery (After stall occurs)
      i) Simultaneously:
   b) Pitch to reduce angle of attack (as necessary to Break the Stall)
   c) Apply Full Power: Full Throttle; Full Rich Mixture; Carb-Heat Off
      i) →At Full Power: Decrease Flaps to 2nd Notch if extended
   d) Level the Wings and Establish Vy pitch attitude
      i) →At Vx and Positive Climb Rate: Decrease Flaps to 1st Notch
      ii) →At Vy: Decrease Flaps to Zero
   e) Return to Maneuver Altitude and Cruise Airspeed
6) Conduct After Takeoff Check
   a) Verify--Flaps-UP
   b) Fuel Boost Pump---------OFF (Verify Pressure)
   c) Landing Light-------------------------------------OFF
   d) Engine Instruments-----------------Verify (Green)
   e) Mixture----Lean During Cruise (After Level-Off)
         i) Above 5,000’ or at Less Than 75% Power

<u>TASK</u>: POWER-OFF STALLS
Objective. To determine that the applicant:
1) Exhibits knowledge of the elements related to power-off stalls.
2) Selects an entry altitude that allows the task to be completed no lower than 1,500 feet (460 meters) AGL.
3) Establishes a stabilized descent in the approach or landing configuration, as specified by the examiner.
4) Transitions smoothly from the approach or landing attitude to a pitch attitude that will induce a stall.
5) Maintains a specified heading, ±10°, in straight flight; maintains a specified angle of bank not to exceed 20°, ±10°; in turning flight, while inducing the stall.
6) Recognizes and recovers promptly after the stall occurs by simultaneously reducing the angle of attack, increasing power to maximum allowable and leveling the wings to return to a straight-and- level flight attitude with a minimum loss of altitude appropriate for the airplane.
7) Retracts the flaps to the recommended setting; retracts the landing gear, if retractable, after a positive rate of climb is established.
8) Accelerates to VX or VY speed before the final flap retraction; returns to the altitude, heading, and airspeed specified by the examiner.

<u>Common</u> <u>Errors</u>:
1) Failure to establish the specified configuration.
   a) Set up as if you were coming in for a landing
   b) Establish a stabilized descent before pitching for stall
      i) Pitch and maintain an attitude that will induce a stall..
2) Improper pitch, heading, and bank control
   a) Use visual as well as instrument references to maintain coordinated level or banked flight
   b) Maintain directional control with the rudder and bank angle as necessary with the ailerons.
3) Rough or uncoordinated control technique.
   a) Maintain SMOOTH (not jerky) control application at all times.
   b) Keep the airplane in coordinated flight, even if the controls feel crossed.
4) Failure to recognize the first indications of a stall
5) Failure to achieve a stall
   a) You must maintain sufficient elevator back pressure to induce a stall.
   b) A full stall is evidenced by:
6) Full back elevator pressure
7) High sink rate
8) Nose-down pitching
9) Possible buffeting
10) Improper torque correction: Use right rudder during power application; keep ball centered.
11) Poor stall recognition and delayed recovery
12) Excessive altitude loss or excessive airspeed during recovery
   a) Pitch to break stall, then smoothly adjust pitch to the desired attitude.
13) Secondary stall during recovery
   a) Caused from hastened or incomplete stall recovery

STALL

- The Stall Regime begins when we exceed the Critical Angle of Attack.
- Most "well behaved" airplanes are designed so that the stall progresses from the wing root to wing tip.
- This allows for fairly predictable warnings and handling characteristics.
- As we continue to a speed below the critical angle of attack, we get an increased imbalance between downward acceleration caused by the weight of the plane and loss of vertical lift.
- This causes airflow separation and a rapid loss of lift.
- The early onset of the stall is characterized by a "Buffeting" as the airflow begins to separate and become turbulent near the root of the wing.
- To "Recover" from a stall, **we must reduce the angle of attack**...
- This is accomplished by relieving rearward pressure on the controls as necessary to reduce the Angle of Attack.
- As lift is restored, simultaneous application of Power will allow recovery of altitude lost.

SPIN (Asymmetrical Stall, ie. One wing stalled MORE than the other)

- A stabilized spin is not different from a stall in any element other than rotation and the same load factor considerations apply to spin recovery as apply to stall recovery.
- Since spin recoveries are usually effected with the nose much lower than is common in stall recoveries, higher airspeeds and consequently higher load factors are to be expected.
- The load factor in a proper spin recovery usually is found to be about 2.5 Gs. The load factor during a spin varies with the spin characteristics of each aircraft, but is usually found to be slightly above the 1 G of level flight.
    - There are two reasons for this:
        - Airspeed in a spin is very low, usually within 2 knots of the unaccelerated stalling speeds.
        - Aircraft pivots, rather than turns, while it is in a spin.
- A spin is typically induced by improper recovery of a stall.
    - Excessive Rudder Application
    - Aileron Application in an attempt to bring “Low” wing up
        - This will INCREASE angle of attack on the “Low” wing and INCREASE the STALL on the the “Low” wing.
- Spin Phases: Insipient, Fully Developed, Recovery.

SPIN RECOVERY

- “P-A-R-E”
- P-ower Idle
- A-ilerons Neutral
- R-udder Opposite Turn
    - (if unsure of direction, use turn coordinator to determine direction of rotation)
- E-levator Pitch Down to Recover from the Stall
    - (followed by a SMOOTH recovery from the Dive)

ACCELERATED STALLS

- Any additional loading applied to the airplane by adding weight or imposing aerodynamic loading through G-Loading will INCREASE THE STALL SPEED.
- The average light plane is not built to withstand the repeated application of load factors common to high speed stalls.
- The load factor necessary for these maneuvers produces a stress on the wings and tail structure, which does not leave a reasonable margin of safety in most light aircraft.
- The only way this stall can be induced at an airspeed above normal stalling involves the imposition of an added load factor, which may be accomplished by a severe pull on the elevator control.
- A speed of 1.7 times stalling speed (about 102 knots in a light aircraft with a stalling speed of 60 knots) produces a load factor of 3 Gs.
- Only a very narrow margin for error can be allowed for acrobatics in light aircraft.
- To illustrate how rapidly the load factor increases with airspeed, a high-speed stall at 112 knots in the same aircraft would produce a load factor of 4 Gs.

CROSS-CONTROLLED STALL

- This type of stall occurs with the controls crossed— aileron pressure applied in one direction and rudder pressure in the opposite direction.
- In addition, when excessive back-elevator pressure is applied, a cross-control stall may result.
- This is a stall that is most apt to occur during a poorly planned and executed base-to-final approach turn, and often is the result of overshooting the centerline of the runway during that turn.
- Normally, the proper action to correct for overshooting the runway is to increase the rate of turn by using coordinated aileron and rudder.
- At the relatively low altitude of a base-to-final approach turn, improperly trained pilots may be apprehensive of steepening the bank to increase the rate of turn, and rather than steepening the bank, they hold the bank constant and attempt to increase the rate of turn by adding more rudder pressure in an effort to align it with the runway.
- The addition of inside rudder pressure will cause the speed of the outer wing to increase, therefore, creating greater lift on that wing.
- To keep that wing from rising and to maintain a constant angle of bank, opposite aileron pressure needs to be applied.
- The added inside rudder pressure will also cause the nose to lower in relation to the horizon.
- Consequently, additional back-elevator pressure would be required to maintain a constant-pitch attitude. The resulting condition is a turn with rudder applied in one direction, aileron in the opposite direction, and excessive back-elevator pressure—a pronounced cross-control condition. The “Low” with the aileron down is at a higher angle of attach causing an asymmetrical stall.