Flight Lesson: Departure Stalls and Spin Awareness

Objectives:

1. exhibit knowledge relating to the elements of power-on stalls, and spins
2. able to perform a power-on stall with minimal assistance from the instructor

Justification:

1. develops the pilot's awareness of stall characteristics and recovery procedures
2. develops the pilot's skill in spin awareness and recovery
3. a pilot must know how to recover from a spin or stall in case of inadvertent entry
4. these maneuvers are required for the private pilot check ride.

Schedule:

Activity	Est. Time
Ground	0.75
Preflight/Taxi	0.25
Flight	1.25
Debrief	0.25
Total	2.50

Recommended Readings:

AFH	Ch 4: 4-8 to 4-16

Elements Ground:

- departure stall overview
- departure stall procedure
- spin overview
- spin procedure

Elements Air:

- departure stalls
  - ➡straight and level
  - ➡turns left and right
- spins to the left and right

Completion Standards:

1. exhibits knowledge of the elements relating to departure stalls, and spins
2. able to perform departure stalls with minimal assistance from the instructor

Common Errors:

- departure stalls
  - ➡ not enough right rudder
  - ➡ not enough nose attitude to induce stall
  - ➡ over controls airplane prior to stall
  - ➡ uses aileron to correct wings during stall
  - ➡ large heading change
  - ➡ pushes controls forward before stopping rotation
  - ➡ does not reduce power upon entry
  - ➡ does not neutralize rudder after rotation stops
  - ➡moves controls forward too much
  - ➡ transitions to climb attitude too fast
- spins

Presentation Ground:

Departure Stall Overview

1. *:a stall with full power, usually during the takeoff climb out (a.k.a. power-on stall)*
2. Done in the takeoff configuration
   (1) In C172 that means flaps up and full power
3. What to Expect
   (1) departure stalls will have more buffeting, and a sharper break when the plane stalls.
   (2) the elevator may be in the full up position when the plane stalls
   (3) airspeed may be below the green arc
      i. most likely due to the installation error of the pitot static system
   (4) stall recover will require a more pronounced release of back pressure, and larger pitch change.

PTS Standards			
initial altitude	>1500 ft AGL	**Δ bank**	±10° (max 20°)
Δ heading	±10°		

Departure Stall Procedure

1. Clear the area!
2. CGGLUMPS
   (1) **C**arb Heat - off
   (2) **G**as - both
   (3) **G**auges - check
   (4) **L**ights - on
   (5) **U**ndercarriage - check (up if retractable)
   (6) **M**ixture - rich
   (7) **P**ower - set 1800 RPM
   (8) **S**eat belts - on
3. maintain altitude
4. at 73 kts, add full power and establish a climb at 73 kts (Vy)
5. set pitch at an attitude that the plane cannot maintain
6. maintain back pressure as plane slows, and try to keep the same attitude
7. at the stall
   (1) decrease AoA by releasing back pressure (and/or push forward)
   (2) let plane increase speed
   (3) gradually return to climb attitude at Vy (73 kts)
   (4) If one wing drops, use the rudder to stop roll, and level the plane, NOT the aileron.

Spin Overview

1. *:an aggravated stall that results in "auto-rotation" wherein the plane follows a corkscrew path in a downward direction.*
2. what is happening
   (1) both wings are stalled...one is just more stalled than the other.
   (2) when a plane stalls in an uncoordinated state, the aircraft will yaw to one side.

(3) this generates an imbalance in the lift being generated, and the plane will roll toward the direction of yaw

i. the lowering wing will have a higher AoA, thus higher drag and less lift (since stalled)

(4) If uncorrected, the airplane will begin to slip in the direction of the lowered wing

(5) air contacts the fuselage, and vertical surfaces, causing he plane to continue yawing in the direction of the lower wing (a.k.a. weathervaning).

(6) the lower wing has a greater AoA because of the upward motion of the relative wind.

(7) thus, the lower wing is stalled more, and the plane continues to roll into the spin.

(8) the rotation, combined with the effects of centrifugal force and different amounts of drag on each wing results in a spin, and the plane descends, rolling and yawing until recover.

3. things to consider

(1) not all planes are certified to practice spins

i. to be certified for spins, a plane must qualify in the utility or acrobatic category

ii. normal category aircraft are NOT certified to do spins

iii. additionally, most aircrafts will also have placards stating whether or not the aircraft is certified for spins, as well as the recovery procedure

(2) spins are ***not*** required for the checkride, but we do them to practice safe recover, and get over the “fear” of spins.

(3) once recover is understood for spins, they are very simple maneuvers

(4) *students will not practice spins on their own*

(5) if a plane is in a spin, by letting go of all the controls, the plane will eventually recover by itself

i. we practice spins to avoid freezing, and holding onto the controls incorrectly.

4. loading of aircraft

(1) proper loading of an aircraft for spins is critical

(2) if the CG is too far aft, centrifugal may cause the spin to flatten out and potentially not be recoverable.

(3) to avoid this situation, the aircraft should be properly loaded, and all load should be properly secure so it won’t shift aft during spine entry and practice

Spin Entry and Recovery Procedure

1. clear the area!
2. configuration during a spin is always clean.

(1) if we have flaps out, we are significantly changing chord lines, and spin characteristics

3. stall with crossed controls, and allow the plane to enter a spin.

(1) note: our airplanes do not go into spins easily, may take some work.

4. typically we will allow 2-3 full rotations before starting spin recovery.
5. recovery

(1) *reduce power to idle*

i.this reduces altitude loss, and lessens the aggravation of the spin

(2) *neutral aileron*

i. aileron correction will only aggravate the stall and spin

(3) *apply full scale opposite rudder from the direction of spin*

i.this will stop the plane from rotating

ii.once rotation has stopped, neutralize rudder.

(4) *push the elevator controls forward to break the stall*

i. it is important that this is done *after* the rotation is stopped, otherwise it only aggravates the spin.

ii. at this point the plane is flying, just fast and very nose low

(5) *pitch up to stop the dive*

i. pitch changes must be done SLOWLY, balancing wing loading factor, and speed limitations to ensure proper recover

ii. add power at the climb attitude.

(6) *resume straight and level* or *climb out as necessary*

Presentation Air:

1. departure stalls
   (1) straight ahead
   (2) in left and right turns
2. spin recover
   (1) spins in both directions