Flight Lesson: Lazy Eights

Objectives:

1. to develop the pilot's feel for varying control forces
2. to develop the pilot's ability to plan and remain oriented while maneuvering the airplane with positive, accurate control
3. to understand the elements relating to the lazy eights maneuver, and be able to perform it to the standards of the PTS

Justification:

1. teaches orientation, planning, accuracy of aircraft maneuvering
2. required for the commercial checkride

Schedule:

Activity	Est. Time
Ground	0.5
Preflight/Taxi	0.25
Flight	1.5
Debrief	0.25
Total	2.50

Recommended Readings:

AFH	Ch. 9: 9-6 to 9-8 Lazy Eights
WEB	http://www.youtube.com/watch?v=px2GpLF3COI

Elements Ground:

- lazy eights overview
- procedure
- notes

Elements Air:

- lazy eights starting left and right

Completion Standards:

1. When the student is able to complete lazy eights to the requirements of the commercial PTS

Common Errors:

- does not arrive at proper altitude and heading at 180° point
- does not continuously change pitch and bank
- does not look at reference point
- forgets to do second turn
- not slow enough at tops of turns
- looks at instruments instead of outside
- at 90° point, doesn't decrease pitch enough so starting altitude is not attained at 180°
- uncoordinated rudder use
- student rushes second 180° turn
- student increases bank too fast

Presentation Ground:

Lazy Eights Overview

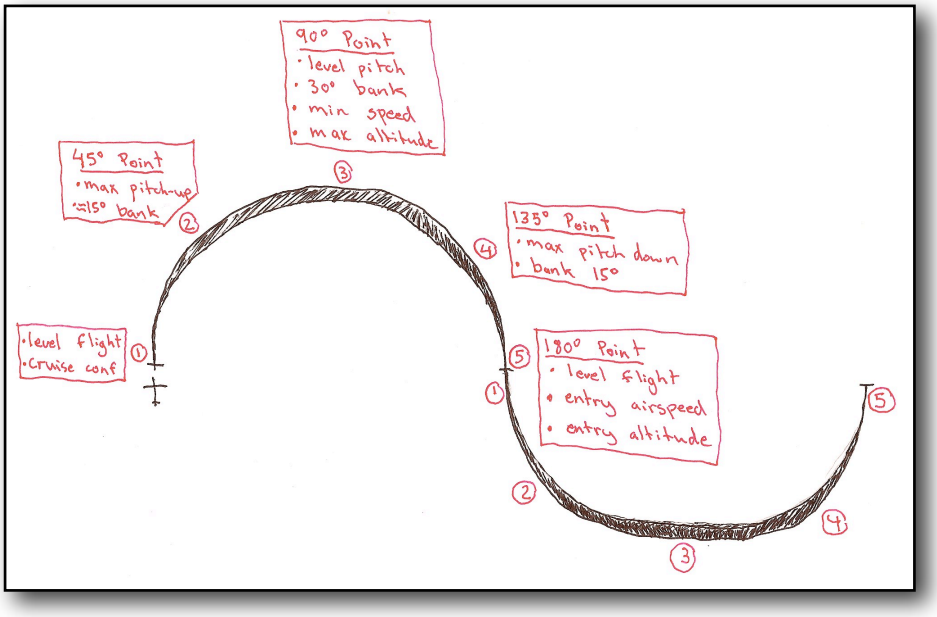
1. *:consists of two 180° turns, in opposite directions, while making a climb and descent in a symmetrical pattern during each of the turns*
2. draw overhead and demonstrate with airplane

PTS Standards			
Initial airspeed	recommended or Va	**final airspeed**	± 10 knots entry
initial altitude	> 1500 AGL	**Δ altitude**	± 100 feet initial
Max Bank	30° at steepest	**Δ heading @ 180°**	± 10°
Other	constant change of pitch and roll rate		

3. maneuver in which pitch, bank, airspeed and direction are always changing
4. called lazy eight because of pattern nose draws on the horizon
5. except for entry, exit, and 180° point, at no point is the aircraft flying straight and level
   (1) since planes get different performance depending on atmospheric conditions, specific altitude gain is not a criterion
6. maneuver is done strictly by reference to outside landmarks
7. power setting remains constant throughout the maneuver

Procedure

1. entry configuration
   (1) prior to starting the maneuver, flaps & gear up
   (2) power set for maneuver.
      (1) C172RG - 19”/2300 RPM
   (3) maneuver should be started at an airspeed no greater than the manufacturer’s recommended speed for chandelles (or in its absence, designed maneuvering speed)
      i. C172RG - 106 kts
   (4) clear area
   (5) pick a prominent reference point off wing that the first turn will be made to keep orientation
2. 0° - 45°
   (1) gradual climbing turn in the direction of the 45° reference point
   (2) pitch should be max by 45°
   (3) bank should be half way (about 15°) by 45°
3. 45° - 90°
   (1) pitch should start to



lower back to horizon slowly

i. don't push nose over, just pull back enough to control nose descent

(2) bank should continue to increase towards 30° bank at the 90° point

4. at 90°

(1) bank should be max of 30°

i. opposite aileron may be required since airspeed is slow

(2) pitch should be passing through level

i. ideally, nose should "slice" through reference point

(3) airspeed should be slowest

i. 5-10 knots above stall speed

ii. right rudder usage will be significant because of slow airspeed

5. 90°-135°

(1) continue to hold back pressure, but add no more

i. this allows pitch to descend below horizon

(2) as airspeed increases, forward pressure will be required

(3) simultaneously, bank should start to shallow

6. at 135°

(1) pitch should be lowest, and airspeed increasing

i. relax rudder pressure as airspeed increases

(2) bank should be at 15° and decreasing

(3) assess situation

i. adjust roll rate to reach level at 180° point

ii. adjust pitch change to end up at level at 180° point and starting altitude

7. 135°-180°

(1) pitch should start to come back up

(2) bank should continue to shallow to level by 180°

8. at 180°

(1) wings level, and pitch level at original speed and altitude

(2) if needed start into next turn

Notes

1. since the airplanes speed is constantly decreasing, right rudder usage will be constantly changing

(1) coordination is important to pay attention to

i. use feel of controls and ball to keep centered

2. rollout coordination is important

(1) because of the effects of lowering an aileron to raise a wing (creating more drag), the plane will want to yaw in the direction of the turn during rollout

i. to the left, the plane will want to yaw even more left (high power setting, high AoA) so significant right rudder will be necessary

ii. to the right, the plane will want to yaw right, but that will be counteracted by left turning tendencies, so don't use too much left rudder

(i) releasing right rudder is usually sufficient

3. in order to hold constant 30° bank, opposite aileron will be increasing through out the first 90° heading change due to decreasing airspeed

4. in order to hold pitch constant , back elevator will continue to increase throughout the second 90° due to decreasing airspeed

5. stall speeds indicated on the airspeed indicator are the power-off stall speeds. the power on stall speeds will be lower than the indicated stall speed due to:

(1) vertical component of thrust available

(2) pitot static installation errors

Presentation Air:

1. lazy eights over practice area
2. continue practice until check ride as maneuver is easily forgotten