Flight Lesson: Normal Takeoffs and Landings

Objectives:

1. exhibit knowledge of the elements relating to the takeoff and landing in normal conditions.
2. be able to perform a normal takeoff and landing with minimal assistance from he instructor on a consistent basis.

Justification:

1. develops the student's ability to control the plane on the ground and the air.
2. develops the student's ability to use the airplane controls during transition from ground operations to in-flight operations.
3. required for every flight.
4. consistency is necessary for solo flight

Schedule:

Activity	Est. Time
Ground	1.0
Preflight/Taxi	0.25
Flight	1.25
Debrief	0.25
Total	2.75

Recommended Readings:

AFH	Ch 5: 5-1 to 5-4 Ch 8: 8-1 to 8-13 8-27 to 8-33

Elements Ground:

- Traffic Pattern Overview
- Pattern Entry and Exit
- Takeoff
- Pattern Procedure
- Touchdown

Elements Air:

- Normal takeoff and landing Pattern work

Completion Standards:

1. when student exhibits knowledge of the elements relating to normal takeoffs and landings
2. when the student is able to perform normal takeoffs and landings with minimal assistance from the instructor

Common Errors:

- does not maintain proper alignment during takeoff
- pulls plane off runway
- climb out nose high
- fixates on instruments
- "aims" for runway
- over controls the aircraft
- does not look over the nose.

Presentation Ground:

Traffic Pattern Overview

1. *:the flow of airplanes around an airport in a specific route for takeoffs, departures,arrivals,and landings.*
2. The traffic pattern is dependent upon the runway in use, wind conditions, obstructions, noise abatement, and other factors.
3. traffic patterns help assure air traffic flow into and out of an airport in an orderly manner.
4. visual identification of other traffic is aided by the use of traffic patterns since you know where to look.
5. traffic patterns are always to the left unless specifically noted otherwise.
   (1) since the pilot sits in the left seat, there is better visibility if flying a left traffic pattern.
   (2) PAO has both left and right traffic patterns
6. turns in the pattern should not be made with more than 30° of bank.

Overhead Pattern view

1. upwind, crosswind, downwind, base, final
2. pattern indicators
   (1) tells a pilot whether a pattern is on he left or right of a runway. If there is none, assume left traffic unless there is additional information available.
   (2) to check a pattern indicator, fly well above the pattern altitude (usually 2000 ft AGL)

Pattern entry and exit

3.Pattern entry is usually done on “the 45”.
4. There are other entries such as straight in, base entry, and overhead entries which will be discussed as necessary.
5. exiting the pattern is usually straight out, left crosswind, right crosswind, or downwind departures.
   (1) at PAO there are left and right Dumbarton departures, lesley salts departure, and overhead 270 departure.
6. a good rule of thumb is to never make any turns before 500 ft AGL when exiting the pattern.

Takeoff

PTS Standards	
Δ airspeed	Vy +10/-5 kts

1. takeoffs are done as directly into the wind as practical.
   (1) shortens takeoff roll distance.
   (2) airspeed is less on the ground, thus less wear and tear on the landing gear.
2. prior to takeoff, always do a run-up and pre-takeoff checklist.
   (1) a run-up is done to check that the engine is running properly and all the instruments are working properly. It is done once, before initial takeoff.
   (2) a pre-takeoff checklist checks that all controls and instruments are in the takeoff configuration including flaps and trim tabs.
3. takeoff roll *:the portion of the takeoff procedure during which the airplane is accelerated from a stand still to an airspeed that provides sufficient lift for it to become airborne.*

(1) after taxiing onto the runway, make sure the plane is aligned with the runway, and *the nose wheel is straight.*

(2) after releasing the brakes, add *smooth and continuous* power to the maximum allowable power

i. application of power must be smooth and not abrupt to

(i) reduce possible torque effect of the engine and propeller

(ii) reduce wear and tear on the engine, which may flood the engine if throttle is advanced too quick

ii. be aware of the left yawing tendency, and correct as necessary to stay on centerline.

(3) the pilots feet should be slid down so that no part of the pilots feet are on the brake portion of the pedal.

(4) directional control should be maintained with positive rudder control.

i. p-factor, slipstream effect, and torque reaction will tend to yaw the plane to the left.

ii.brakes should be avoided during a normal takeoff as this will reduce acceleration, and could lead to unwanted swerving.

(5) engine instruments should be checked for proper readings, and airspeed indicator should be checked for “alive”.

(6) at rotation speed, the plane should be smoothly pitched up to the climb attitude (C152-50 kts, C172-60 kts)

Normal liftoff (rotation)

1. rotation *:the act of becoming airborne as a result of the wings lifting the airplane off the ground, or the pilot rotating the nose-up, increasing the AoA to start a climb.*

2. holding the climb attitude, the plane will liftoff, and should be flown in the climb attitude.

(1) do not pull the plane off.

i. this could cause the plane to settle back to the ground, or even stall.

ii. “the plane has to want to fly”

3. maintain wings level with aileron control

4. initial climb

(1) the plane needs to accelerate to Vy after liftoff. Maintaining the proper climb attitude should result in Vy.

(2) Airspeed is controlled by pitch.

(3) maintain Vy until Pattern altitude

Pattern

PTS Standards			
altitude	pattern alt	**Δ altitude**	± 100 ft
airspeed	appropriate a/s	**Δ airspeed**	± 10 kts

1. upwind

(1) The airplane is usually flown upwind until 300 ft before the pattern altitude, climbing at Vy the entire time.

(2) if required to extend our upwind, level off at pattern altitude and reduce power to 2100 RPM.

(3) Maximum bank of 30°

2. crosswind

(1) check for traffic before making the turn
  i. turn based on your sequence in the pattern, or in it's absense, 300 ft below pattern altitude.
(2) pattern altitude is typically reached on crosswind so level with:
  i. Pitch - level attitude
  ii. Power - 2100 RPM
  iii. Trim - as necessary
    (i) now pitch controls altitude, power controls airspeed
(3) in most cases, roll level, and then start turn to downwind
(4) maximum bank 30°

3. downwind
(1) power should be 2100 RPM, and altitude should be pattern altitude
(2) trim plane properly
(3) midfield - CGGLUMPS
  i. **C**arb heat - on
  ii. **G**as - check both
  iii. **G**auges - check
  iv. **L**ights - as required
  v. **U**ndercarriage - down and locked
  vi. **M**ixture - rich
  vii. **P**ower - check 2100 RPM
  viii. **S**eatbelt - on
(4) "abeam numbers"
  i. Power - 1600 RPM
  ii. flaps - 10°
  iii. descend at 80 in C172, 70 in C152
    (i) now, pitch controls airspeed, power controls altitude
(5) when runway is 45° over the shoulder, turn base
(6) maximum bank 30°

4. base
(1) flaps 20°
(2) descend 75 in C172, 65 in C152
(3) turn to final as necessary to alight properly
(4) maximum bank of 20°

5. final
(1) flaps - full
(2) approach speed - 65-70 in C172, 55-60 in C152
(3) now plane is in landing configuration

6. 3x theory
(1) remember to start descent at 3x,not at certain position.
(2) it's distance from the landing point that is important

Landing

PTS Standards			
initial airspeed	approach speed	**Δ airspeed**	+10/-5 kts
touchdown	-0/+400 ft	**tchdwn speed**	≈ Vso

1. on the landing approach, the pilot must judge the descent angle to make the runway
   (1) changes in descent is done with use of power to control the altitude and descent rate of the airplane
   (2) airspeed is to remain constant during a landing approach - pitch controls airspeed
2. pilot should select a touchdown point on the runway, and ideally, this point should not move in the windshield
   (1) if point moves up on windshield, the plane is below the glide path
   (2) if point moves down on windshield, the plane is above the glide path
3. keep airspeed constant, and use power to control the rate of descent
   (1) if plane is too fast, pitch up
   (2) if plane is too slow, pitch down
   (3) add or reduce power to control the rate of descent
4. when the plane is 10-20 feet above the runway, a roundout & flare should begin
   (1) roundout *:the part of the final approach where the plane makes a transition from a stablized descent to a level attitude very close to the runway*
   (2) flare *:the part of the final approach where the plane bleeds off any remaining excess energy before touching down*
   (3) transistion eyes to the end of the runway
   (4) by raising the nose, we are slowing the airplane down, and leveling the plane off so the main gear touch the ground first
   (5) power should be reduced and the plane should be held in the air for as long as possible
      i. “the plane has to *want* to land”
      ii. “eyes out, power out, round out”
   (6) touch down
      i. same as an approach to landing stall.
      ii. continue to pitch the nose up.
      iii. the stall horn may sound, and this is actually good
         (i) the pilot should hold the plane off so that a full stall landing occurs prior to touchdown.
      iv. ***never*** push the plane forward if the plane balloons. just keep the same attitude, and let the plane settle down.
         (i) pushing forward may result in a nose first landing
   (7) the plane will slow by aerodynamic braking
   (8) apply light brakes as necessary to help stop the aircraft
      i. smooth application helps reduce lock up, sudden nose drop, and wear and tear on the brakes and wheels
   (9) come to a near complete stop before attempting runway exit
   (10) perform after landing checklist after clearing the runway and coming to a complete stop.

Presentation Air:

1. Normal takeoffs and Landings