

# Task VII.A: Normal and Crosswind Takeoff and Climb

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## Lesson Overview

### Objective

- Takeoff and climb are critical phases of flight because the airplane is low to the ground, at a high angle of attack, a high power setting, and low airspeed. In this lesson you'll learn the correct procedures to safely take off.
- A normal takeoff is a takeoff which the airplane departs directly into the wind. We'll discuss this type of takeoff and also a Crosswind takeoff that the plane isn't taking off directly into the wind.

### Reference

- Airplane Flying Handbook - Chapter 5 (Page 1 to 11)
- Pilot's Operating Handbook

### Maneuver Elements

- Clear the area
- Choose forced landing area
- Configure aircraft: flaps up, cowl flaps open, propeller to full
- Select outside references: vanishing point on runway
- Taxi onto runway centerline, using wind correction during taxi
- Position full ailerons into the direction of the wind (turn into for headwinds, dive away from tailwinds)

- Smoothly apply full power
- Anticipate need for right rudder pressure and to maintain centerline
- Check engine instruments (in green)
- As controls become effective, gradually reduce aileron / rudder pressures
- At Vr, gradually apply back pressure to lift nose wheel
- Pitch for normal climb attitude, climb at Vy
- Gear up upon positive rate of climb, safe airspeed, no useable runway
- Crab into wind as necessary to maintain extended runway centerline
- Maintain ball centered
- Look for traffic

### **Aircraft Setup**

Flaps up Vr (PA28A: 65 KIAS/70 KIAS Hot Weather Ops) Vy (PA28A: 76 KIAS/85 KIAS Hot Weather Ops)

### **Completion Standards**

The lesson is complete when the student is able to walk through a normal or crosswind takeoff on the ground, providing knowledge of common errors regarding these procedures. The student also should be able to confidently demonstrate a takeoff with or without a crosswind.

# **Instructor Notes**

## **Introduction**

### **Attention**

The takeoff is one of the most basic and exciting parts of flying. Different situations regarding wind and weather, runway size and length, and the runway surface will provide different challenges for every flight.

### **Overview**

Review Objectives and Elements/Key ideas

### **What**

A normal takeoff is one in which the airplane is headed into the wind, or the wind is very light. Also, the takeoff surface is firm, and of sufficient length to permit the airplane to gradually accelerate to normal lift-off and climb-out speed, and there are no obstructions along the takeoff path. While it is preferable to takeoff into the wind, there will be many instances when circumstances dictate otherwise. A crosswind takeoff is a normal takeoff with the only exception being that the airplane is no longer headed directly into the wind.

### **Why**

It is essential to every flight you will ever take! A smooth, skillful and safe takeoff is a key element of pilot proficiency. It is essential for the pilot to be able to perform a safe and smooth

takeoff and have the ability to control the aircraft in varying conditions, starting with the basics. You need to be on your game while maneuvering close to the ground - takeoffs are, by definition, performed at and near the ground.

## Lesson Details

### Research (Before takeoff you should know)

- Runway - Length/Condition
- Wind - (ideally taking off into it)
- Obstructions
- Plane - POH performance numbers
- Airport - AF/D

### Before Takeoff (Taxi/Hold Short)

- Position perpendicular to runway (Able to see both departure and approach ends of runway)
- Confirm that we're on the correct runway, use runway signs.
- Verify wind direction with windsock.
- Use the manufacturers pre-takeoff checklist. *Do not switch fuel tanks after the pre-takeoff runup. Take off with the tank you did the runup on*
- Verify appropriate configuration, typically flaps fully retracted and mixture full rich in the PA28A Warrior.
- Cockpit Organized
- Last Minute passenger briefing, confirm the cockpit is sterile.
- Mentally prepare to handle engine abnormalities, land straight ahead if below 600 feet AGL.
- **Avoid Runway Incursions - Watch for traffic that might not be talking on the radio or an aircraft in distress**
- Get Clearance (if controlled)

### Holding Short

- Consider Wake Turbulance

### Pre Takeoff (Entering runway)

- Obtain clearance to takeoff
- Verify no aircraft on final before crossing the hold short line.
- Once on runway, verify compass heading with runway heading.
- Glance all the way down the runway for possible opposite direction traffic and foreign object

debris (FOD)

## In Position

1. The Plane ☐☐
  - a. On Centerline
  - b. Controls (aileron and elevator) positioned for wind. They may change after liftoff, be prepared.
2. The Pilot ☐☐☐☐☐☐
  - a. Sit correctly, heels on the floor (dont ride the brakes during hte takeoff roll).
  - b. hand on the throttle.

Planning is critical for a safe, low-stress takeoff!

## Takeoff

### Normal Takeoff

1. Add full power, smoothly, and cross-check engine instruments.
2. Maintain centerline.
3. Look down runway to the far end, don't stare at nose of airplane, looking down-runway will help you stay on the center-line.
4. At rotation speed, apply back pressure for liftoff but keep the ailerons level.
5. After powering up, torque, P-factor and left-turning tendencies increase. You might need more right rudder to maintain centerline.
6. After takeoff, you may fiund a little wind above the tree tops. Be prepared for a possible crab in order to maintain the extended centerline.
7. Maintain attitude for desired climb speed ( $V_x$ ,  $V_y$  or 84 for hot weather in PA28A).
8. Trim.
9. Climb straight out until 400' AGL feet then turn crosswind.
10. Complete after-takeoff checklist, if appropriate.

### Crosswind Takeoff

1. Calculate crosswind takeoff component.
2. Maximum demonstrated crosswind component isn't a limitation, but it gives you an indication of where most new pilots consider it too much cross-wind for takeoff. *Don't assume that the controller will assign best runway for takeoff!*
3. Once in position for takeoff on runway, position the ailerons fully into the wind and hold the elevator neutral.
4. As speed increases, wind increases over control surfaces making them more effective. Be

prepared to reduce the control deflections slightly.

5. In strong crosswinds, delay takeoff until  $V_r+2-5$  KIAS). You want to make a clean takeoff and not be drug across the runway. This procedure needs a clean takeoff from the ground, with purpose.
6. After leaving the ground, you will need to crab to maintain the extended centerline over the runway. Don't let the aircraft drift off the protected runway area.

## Reasons for rejected Takeoff

1. Don't try to fix a problem during the takeoff roll.
2. Engine gauges - Showing faults?
3. Engine sounds - Sputtering or abnormalities?
4. Engine not developing full power?
  - a. (PA28A JPI should show 82%+ power at sea level on a hot day)
5. Pilot distracted?
6. Passenger excited or panicking?
  - a. (Do they see somethign you don't? PRE FLIGHT: See/Say)
7. Door or window open? (Note an open door in the PA28A is not an emergency, and often is better to ask to land and do a stop/taxiback)
8. Not able to control centerline? (Flat tire?)
9. Takeoff roll in slow motion (Parking brake or pilot/pax riding toe brakes?)

## ☐☐ Common Errors ☐☐

- Failure to adequately clear the area prior to taxiing onto the active runway
- Using less than full aileron pressure into the wind initially on the takeoff roll
- Mechanical use of aileron control rather than sensing the need for varying aileron control input through feel for the airplane
- Premature lift-off resulting in side-skipping
- Excessive aileron input in the latter stage of the takeoff roll resulting in a steep bank into the wind at lift-off
- Inadequate drift correction after lift-off

## Conclusion

The lesson may have seemed technical or overbearing, but takeoffs are enjoyable. Not every takeoff will be the same and therefore adjustments will have to be made. A strong understanding of what is involved in a normal and crosswind takeoff is essential to every flight.

# ACS Requirements

To determine that the applicant:

1. Exhibits instructional knowledge of the elements of a normal and crosswind takeoff and climb by describing:
  - a. Procedures before taxiing onto the runway or takeoff area to ensure runway incursion avoidance. Verify ATC clearance/no aircraft on final at non-towered airports before entering the runway, and ensure correct takeoff runway positioning of the airplane with consideration for other aircraft, surface conditions, and wind.
  - b. Normal and crosswind takeoff and lift-off procedures.
  - c. Difference between a normal and a glassy-water takeoff (ASES).
  - d. Proper climb attitude, power setting, and airspeed ( $V_y$ ).
  - e. Proper use of checklist.
2. Exhibits instructional knowledge of common errors related to a normal and crosswind takeoff and climb by describing:
  - a. Improper runway incursion avoidance procedures.
  - b. Improper use of controls during a normal and crosswind takeoff.
  - c. Inappropriate lift-off procedures.
  - d. Improper initial climb attitude, power setting, and airspeed ( $V_y$ ).
  - e. Improper use of checklist.
3. Demonstrates and simultaneously explains a normal or a crosswind takeoff and climb from an instructional standpoint.
4. Analyzes and corrects simulated common errors related to a normal or a crosswind takeoff and climb.

## Private Pilot ACS Skills Standards

1. Complete the appropriate checklist.
2. Make radio calls as appropriate.
3. Verify assigned/correct runway.
4. Ascertain wind direction with or without visible wind direction indicators.
5. Position the flight controls for the existing wind conditions.
6. Clear the area; taxi into takeoff position and align the airplane on the runway centerline (ASEL, AMEL).
7. Confirm takeoff power and proper engine and flight instrument indications prior to rotation (ASEL, AMEL).

8. Rotate and lift off at the recommended airspeed and accelerate to VY.
9. Establish pitch attitude to maintain the manufacturer's recommended speed, or VY +10/-5 knots.
10. Retract the landing gear and flaps in accordance with manufacturer's guidance.
11. Maintain VY +10/-5 knots to a safe maneuvering altitude
12. Maintain directional control and proper wind drift correction throughout takeoff and climb.
13. Comply with noise abatement procedures.

## Commercial Pilot ACS Skills Standards

The same as the Private Pilot, except:

1. Establish pitch attitude to maintain the manufacturer's recommended speed, or VY +/-5 knots.
2. Maintain VY +/-5 knots to a safe maneuvering altitude.