

INSTRUMENT TAKEOFF (I.T.O.)

OBJECTIVE

To teach the instrument student knowledge of the elements related to an instrument takeoff and the primary instruments for pitch, bank, and power.

COMPLETION STANDARDS

This maneuver is not required on the Instrument Rating Practical Test.

DESCRIPTION

A takeoff by reference to instruments which may be required during departures under conditions of low visibility, rain, low ceilings, or at night.

PROCEDURE

1. Cockpit Check

- a. Complete a careful instrument cockpit check.
- b. Set the miniature airplane on the attitude indicator for level flight.
- c. Set the trim for takeoff.

2. Prior to takeoff

- a. Determine if you have the required visibility to take off. (FAR Part 91 has no minimum).
- b. If weather is below landing minimums back into the departure airport, find a suitable takeoff alternate in case you need to divert right after departing.
- c. Record takeoff time.

3. Taxi to the takeoff position

- a. Accurately align the airplane with the runway centerline. Assure that the nose wheel is straight.
- b. Hold the airplane stationary with brakes.
- c. Set the heading indicator with the heading index on the five degree mark nearest the published heading of the runway.

4. Takeoff

- a. Advance the power to a setting that will provide partial rudder control.

- b. Release the brakes and advance the throttle smoothly to takeoff power.
- c. During the takeoff roll, the heading indicator is primary for directional control. Control heading with rudder. (Use brakes as a last resort.)
- d. Note airspeed alive.
- e. As you reach rotation speed, note acceleration error on the attitude indicator and establish takeoff pitch attitude on the attitude indicator (approximately two bar widths).
- f. As the airplane becomes airborne, the pitch and bank attitudes are controlled by reference to the attitude indicator. When the altimeter and vertical speed indicator show a climb, you are airborne. The heading indicator now becomes primary for bank.
- g. Continue to maintain the pitch attitude by reference to the attitude indicator.
- h. Maintain a stable climb as indicated by the altimeter and vertical speed indicator, and at 100 AGL retract the landing gear.
- i. Maintain a pitch attitude on the attitude indicator that will give you a continuous climb on the vertical speed indicator and a smooth increase in airspeed.
- j. Retract flaps when at a safe altitude and airspeed.
- k. When climbing airspeed is reached reduce power to climb setting. The airspeed indicator is now primary for pitch and the RPM/MP is primary for power.
- l. The climb out is accomplished as a constant airspeed climb.
- m. Retrim the aircraft.
- n. Reset the heading indicator to magnetic compass.
- o. Comply with the departure procedure.

References

Instrument Flying Handbook FAA-H-8083-15, pg. 5-33 ⇒ 5-34
Federal Aviation Regulation 91.175.

INSTRUMENT TAKEOFF (I.T.O.)

1 Taxi into position

- Align aircraft with centerline
- Hold brakes
- Set HI to nearest 5° mark

2 Takeoff

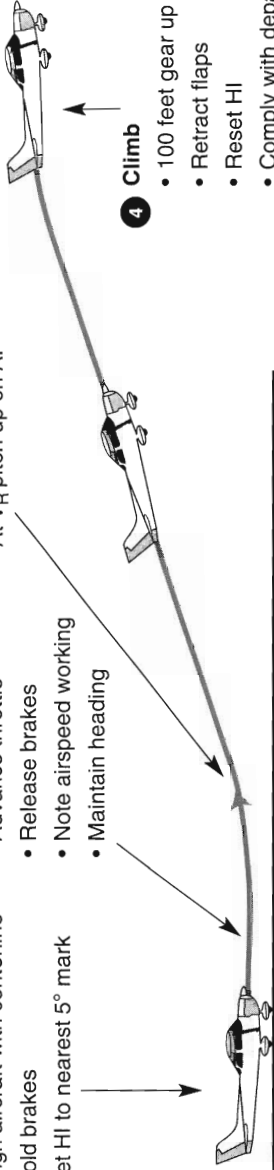
- Advance throttle
- Release brakes
- Note airspeed working
- Maintain heading

3 Rotation

- At V_R pitch up on AI

4 Climb

- 100 feet gear up
- Retract flaps
- Reset HI
- Comply with departure procedure



AC	V_R	V_Y	V_Y PITCH	CRUISE CLIMB	CRUISE PITCH	CRUISE POWER
C172	55	75	+6°	85	+4°	FULL

	PRIMARY			SUPPORTING		
	PITCH	POWER	BANK	PITCH	POWER	BANK
T/O ROLL	—	RPM/MP	HI	—	AS	TC
ROTATION	AI	RPM/MP	AI	ALT/VSI	AS	TC/HI
CLIMB	AS	RPM/MP	HI	AI/VSI	VSI	TC/AI

Limitations — This maneuver is not required on the practical test.

STRAIGHT AND LEVEL FLIGHT

OBJECTIVE

To teach the instrument student knowledge of the elements relating to attitude instrument flying during straight-and-level flight.

COMPLETION STANDARDS

1. Maintains straight-and-level flight in the aircraft configuration specified by the examiner.
2. Maintains the heading within 10°, altitude within 100 feet (30 meters) and airspeed within 10 knots.
3. Uses proper instrument cross-check and interpretation, and applies the appropriate pitch, bank, power, and trim corrections.

DESCRIPTION

With reference to flight instruments only, altitude, heading and airspeed are maintained utilizing proper scan, interpretation and airplane control techniques.

PROCEDURE

1. Establish the attitude for straight and level flight by reference to the attitude indicator, then set power for the desired airspeed by reference to the tachometer and/or MP (Manifold Pressure) gages.
2. As the airplane stabilizes, adjust trim to relieve all control pressures.
3. Continue scanning of all instruments, using altimeter as primary instrument for pitch, airspeed as primary for power, and heading indicator as primary for bank.
4. Interpret the instruments to determine if minor adjustments are required. Decide how the adjustments, if needed, are to be made.
5. Apply the proper control of pitch, power or bank as needed.
 - a. For altitude errors of less than 100 feet on the altimeter, correct using 1/2 bar width on the attitude indicator. (The bar refers to the miniature airplane's wings.)
 - b. For altitude errors of more than 100 feet on the altimeter, correct them by using an initial full bar width correction on the attitude indicator. Vertical Speed Indicator (VSI) rate

of return should be twice the amount of altitude the airplane is off. So, if you are off 200 feet, you should use a VSI rate of 400 fpm.

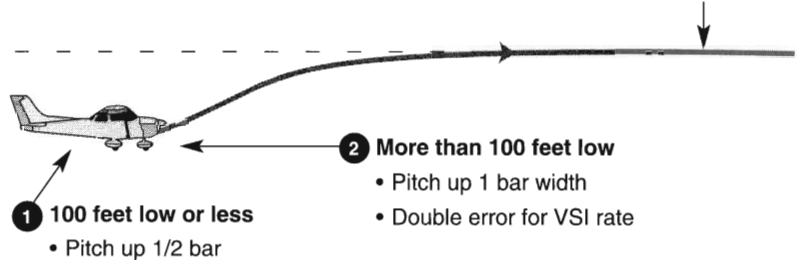
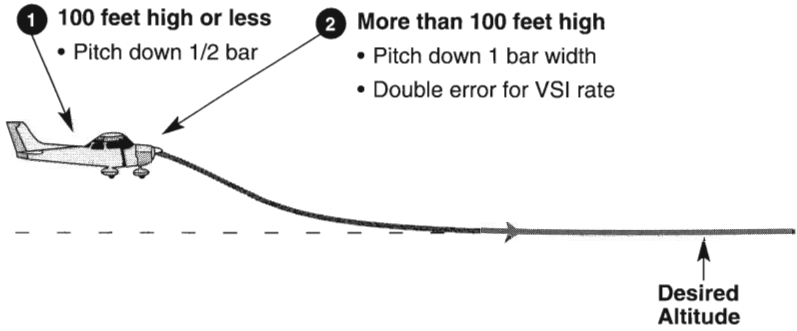
- c. For heading errors, make your correction to the desired heading by using a bank angle half the number of degrees to be turned, not to exceed standard rate.
 - d. For airspeed errors, adjust power 100 RPM/1" MP for each five knots of airspeed. Let the airplane stabilize and trim off control pressures.
6. Continue scanning of all instruments noting how the supporting instruments can aid in your interpretation and subsequent control.
 7. Repeat steps 2 through 6.

Note: The student must be able to demonstrate straight-and-level flight using all available instruments or without the use of the attitude and heading indicators.

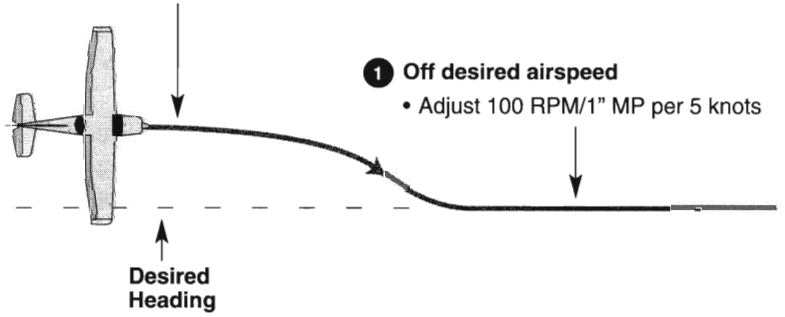
References

Instrument Rating Practical Test Standards FAA-S-8081-4C, pg. 1-7.
Instrument Flying Handbook FAA-H-8083-15, pg. 5-1 ⇒ 5-15.

STRAIGHT AND LEVEL FLIGHT



- 1 Off desired heading**
 • Use bank angle 1/2 number of degrees off
 • Do not exceed standard rate



PRIMARY			SUPPORTING		
PITCH	POWER	BANK	PITCH	POWER	BANK
ALT	AS	HI	AI/VSI	RPM/MP	TC/AI

Limitations — Heading $\pm 10^\circ$ • Altitude ± 100 Feet • Airspeed ± 10 Knots