THE KNEEBOARD REFERENCE GUIDE

PERFORMANCE MANEUVERS

LAZY EIGHTS

PURPOSE

The purpose of this maneuver is to develop pilot feel for varying control forces and the ability to plan and remain oriented while maneuvering the airplane with positive and accurate control.

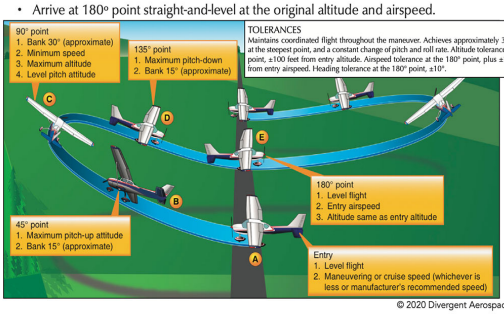
DESCRIPTION

This maneuver consists of two 180° turns in opposite directions while making a climb and a descent in a symmetrical pattern during each of the turns. It is the only standard flight training maneuver during which at no time do the forces on the controls remain constant.

MANEUVER EXECUTION

Complete clearing turns. Altitude ≥1,500′ AGL. In a non-populated area, select a reference point at 45° / 90° / 135° angles. Note initial entry heading and altitude. Propeller Set. Mixture Set.

- Execute a gradual climbing turn toward the 45° point. Increasing both pitch and bank so that at the 45° point the aircraft is at the highest pitch and 15° AOB.
- From 45° to 90° decrease pitch to the horizon while increasing bank. At the 90° point, the aircraft will be at it's maximum altitude and level. *Approximately 30° AOB and 5-10 $^{K}_{IAS}$ above stall, while gradually reducing elevator back pressure.*
- From 90° to 135° slowly roll out bank while gradually lowering the nose. Upon reaching 135°, the nose is at the lowest pitch. *It should be equal to but opposite of the highest pitch achieved earlier, with 15° AOB.*
- Arrive at 180° point straight-and-level at the original altitude and airspeed.



BASIC AIRCRAFT CONTROL

SLOW FLIGHT

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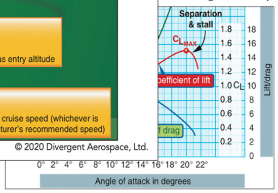
d to Maintain a Level Pitch Attitude.

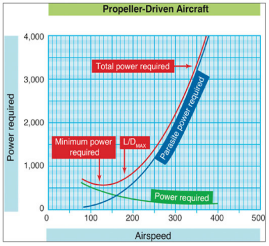
10% More Power For Any Turns.

ll Power, Incrementally Retracting Flaps, and Gear.

Cruise Flight, or as specified by the examiner.

STANDARDS	PRIVATE	COMM.
Altitude	±100 feet	±50 feet
Airspeed	+10/-0 knots	+5/-0 knots
Heading	±10°	±10°
Bank Angle	±10°	±10°





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AEROSPACE

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PREFACE

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GENERAL AIRPORT OPERATIONS

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GENERAL AIRPORT OPERATIONS

REQUIRED PIC BRIEFINGS

PRE-ENGINE START BRIEF - §91.519

Prior to engine start, the PIC will brief the following information to passengers:

- FAA Prohibits Smoking in the Aircraft.
- Emergency Exit Locations.
- Location & Operation of Fire Extinguisher (if so equipped).
- Location & Operation of Seat-belts.
- Sterile Cockpit During Critical Phases of Flight.
- Positive Exchange of Flight Controls.

REQUIRED BRIEFINGS - PRIOR TO DEPARTURE

DEPARTURE BRIEFING

- Type of Flight (VFR/IFR)
- Intended Runway of Use, Runway Length, and Takeoff Distance Required.
- Initial Climb Heading, Initial Altitude, and Target Airspeed.

EMERGENCY BRIEFING

ENGINE FAILURE – TAKEOFF ROLL

Immediately retard throttle, apply maximum braking, maintain directional-control, and exit runway if able.

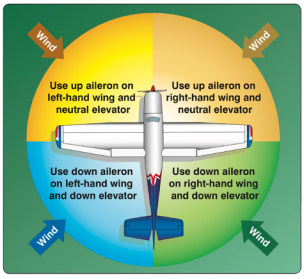
ENGINE FAILURE – (AFTER ROTATION) | USABLE RWY

Immediately retard throttle, place the aircraft back on the runway, apply maximum-braking, maintain directional control, and exit runway if able.

ENGINE FAILURE – (AFTER ROTATION) | NO USABLE RWY

BELOW 1000' AGL | Execute forced landing straight ahead in the safest open field, or road; turning only to avoid obstacles.

ABOVE 1000' AGL | Time permitting, troubleshoot. If restart is unsuccessful, turn the aircraft toward any runway or hard surface and execute a forced landing. Consider wind direction and speed.



EMERGENCY AIRSPEEDS

V_{REF} • (Full Flaps) _____ $^{K}_{IAS}$

V_G • $^{M}_{GTOW}$ (Clean) _____ $^{K}_{IAS}$

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TRAFFIC PATTERN OPERATIONS

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TRAFFIC PATTERN OPERATIONS

NORMAL (X-WIND) TAKEOFF & CLIMB

DESCRIPTION

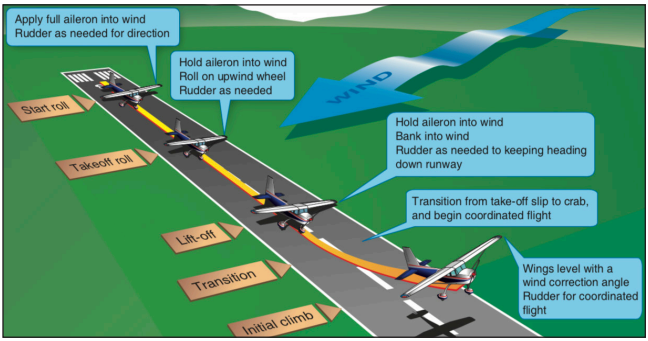
A normal takeoff is one in which the aircraft is headed into the wind (normally) on a hard surface, like pavement, allowing the aircraft to easily accelerate to normal lift-off speed and climb-out. Normally, no obstacles are present for this takeoff.

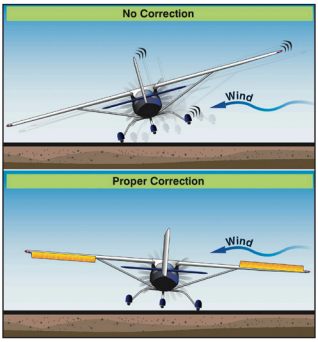
During a crosswind takeoff, aileron control must be held INTO the wind. This raises the aileron on the upwind wing, which imposes a downward force on the wing, counteracting the lifting force of the crosswind, thus preventing the wing from rising.

MANEUVER EXECUTION

Determine the wind direction. Takeoff should be made into the wind. Propeller set High RPM (if so equipped). Mixture Set. Once lined up on the runway, check heading indicator matches runway heading. When cleared for takeoff, turn the landing light on, thence...

- Smoothly apply full-power. Smoothly rotate at V_R.
- Apply necessary wind correction with the ailerons, slowly removing it as necessary to maintain directional control and runway centerline.
- Continue the climb-out at a pitch attitude that produces V_Y.
- Once Positive Rates have been established, retract the landing gear (if so equipped).
- At a safe altitude (500' AGL), turn (if necessary). Maintain Coordination.
- At 1,000' AGL set climb power and run the after-takeoff checklist.





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BASIC AIRCRAFT CONTROL

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BASIC AIRCRAFT CONTROL

SLOW FLIGHT

PURPOSE

To familiarize the student with the flight characteristics of the aircraft on the backside of the power curve, and to learn how to recognize when the aircraft is close to the onset of a stall. The student will apply fundamentals learned during slow flight to master low-speed flight, especially during the landing phase.

DESCRIPTION

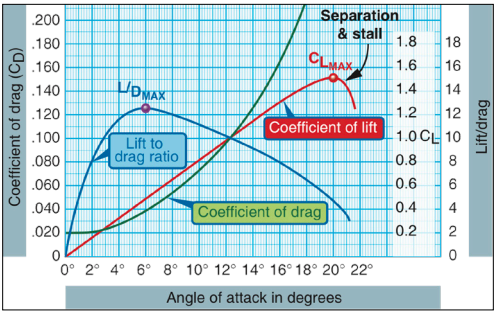
This maneuver will be executed slightly above Minimum Controllable Airspeed ($^{M}_{CA}$). Where any further increase in AOA, bank angle, load factor, or decrease in airspeed, will induce an immediate stall.

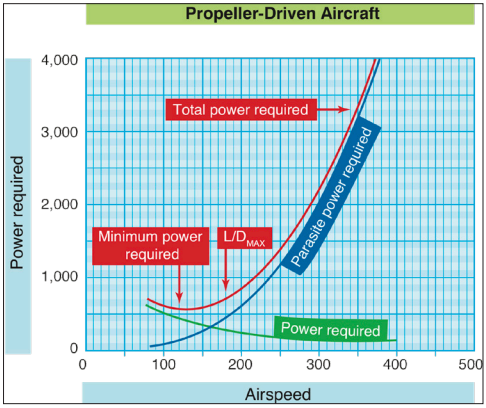
MANEUVER EXECUTION

Complete clearing turns. Altitude ≥1,500′ AGL (ASEL) or ≥3,000′ AGL (AMEL). In a non-populated area, select a reference point. Note initial entry heading and altitude. Propeller Full Forward. Mixture Set. Select an airspeed slightly above $^{M}_{CA}$ (5-10 knots above the 1G stall speed for ACS). All turns should be half-standard rate.

STANDARDS	PRIVATE	COMM.
Altitude	±100 feet	±50 feet
Airspeed	+10/-0 knots	+5/-0 knots
Heading	±10°	±10°
Bank Angle	±10°	±10°

- Enter Maneuver in Landing Configuration (Flaps Full & Power Initially at Idle).
- Decelerate Aircraft to 1.3x $^{V}_{SO}$ or (Appropriate Speed for Certification PTS/ACS).
- Add Power as Needed to Maintain a Level Pitch Attitude.
- Apply Approximately 10% More Power For Any Turns.
- Recover by Adding Full Power, Incrementally Retracting Flaps, and Gear.
- Return the aircraft to Cruise Flight, or as specified by the examiner.





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GROUND REFERENCE MANEUVERS

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GROUND REFERENCE MANEUVERS

S-TURNS ACROSS A ROAD

PURPOSE

This maneuver will develop the airman's ability to compensate for wind-drift during turns, orient the aircraft flightpath with ground references, follow an assigned ground track, arrive at specified points on assigned headings, and divide attention.

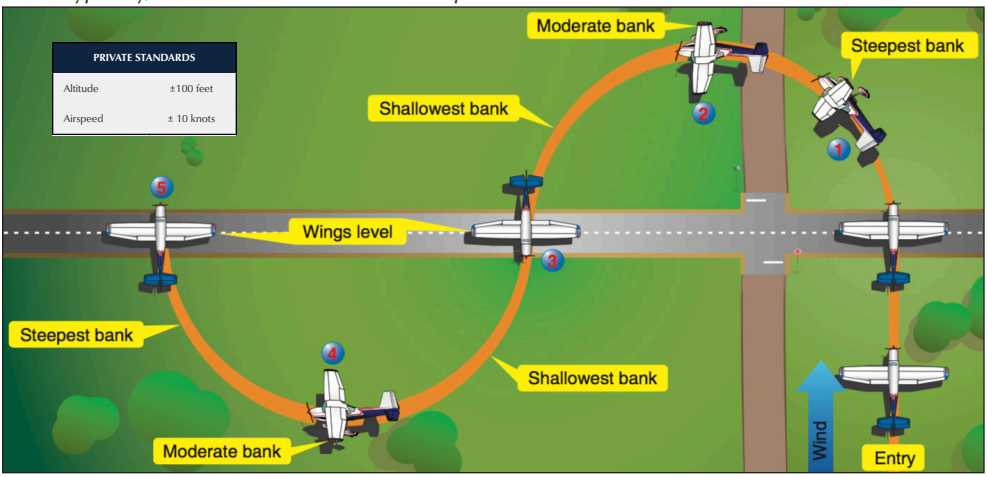
DESCRIPTION

The maneuver consists of crossing a reference line at a 90° angle and immediately beginning a series of 180° turns of equal radii in opposite directions, re-crossing the road at a 90° angle just as each 180° turn is completed.

MANEUVER EXECUTION

Complete clearing turns. In a non-populated area, select a reference line (at an altitude of between 600′ to 1000′ feet AGL) that will permit several 180° turns. Ideally, a road that is perpendicular to the wind, and is 2-3 NM wide will suffice. Note initial entry heading and altitude. Propeller Set. Mixture Set.

- Enter on a Downwind, in a Clean Configuration, on Altitude, on Airspeed (below V_A).
- Initial Entry will be on a downwind. Immediately upon crossing the reference line, the first turn should be immediately executed.
- Continue to vary AOB so that the airplane is wings level directly over and perpendicular to the reference line.
- Exit the maneuver on a Downwind Entry Heading at Entry Airspeed, and Entry Altitude. *Typically, a total of two S-Turns will complete the maneuver.*



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PERFORMANCE MANEUVERS

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PERFORMANCE MANEUVERS

STEEP TURNS

PURPOSE

To develop the smoothness, coordination, orientation, division of attention, and control techniques necessary for the execution of maximum performance turns when the airplane is near its performance limits.

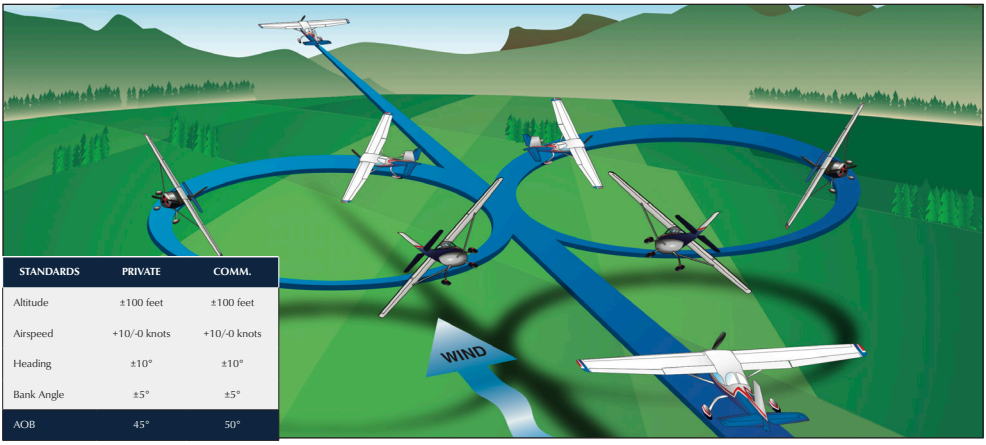
DESCRIPTION

This maneuver consists of two 360° turns in opposite directions while the aircraft is placed in a coordinated, 45° to 50° bank angle. During this maneuver, the steep bank angle causes an over-banking tendency during which maximum turning performance is attained and relatively high load factors are imposed.

MANEUVER EXECUTION

Complete clearing turns. Altitude ≥1,500′ AGL. In a non-populated area, select a well defined outside reference point that can be easily identified. Note initial entry heading and altitude. Mixture Set.

- Clean Configuration, Airspeed Below V_A then, Propeller Full Forward (if applicable).
- Identify Outside Visual Reference Point and Inside Heading.
- Roll Into a 45°/50° Bank, Add 10% of Entry Power at 30° AOB (100-200 RPM).
- Once Passing 30° AOB, Trim as Required to Maintain a Level Pitch Attitude.
- Exit the maneuver after performing a turn in the opposite direction. Ensure the roll-out occurs on the same Entry Heading, Airspeed and Altitude.
- Lead the roll-out turn by approximately 20° on the Heading Indicator.



STANDARDS	PRIVATE	COMM.
Altitude	±100 feet	±100 feet
Airspeed	+10/-0 knots	+10/-0 knots
Heading	±10°	±10°
Bank Angle	±5°	±5°
AOB	45°	50°