



HARBOUR AVIATION

FLIGHT TRAINING • FORT WORTH

PRIVATE PILOT TRAINING • PRE-SOLO FLIGHT MANEUVERS

PRE-SOLO MANEUVERS STUDY GUIDE

The fifteen flight maneuvers and procedures your instructor will train and sign you off in before your first solo around the pattern — built around 14 CFR 61.87(d), your 1976 Cessna 172M, and Bourland Field.

PREPARED BY **ADAM FIELDS, CFI-I**

REFERENCE AIRCRAFT: 1976 CESSNA 172M (160 HP STC)

HOME FIELD: BOURLAND 50F • RWY 17/35

DAY VFR • LOCAL PATTERN

WHAT YOU'LL COVER

- | | |
|---|--|
| 01 The 15 Required Maneuvers | 06 Pattern, Go-Arounds & Slips |
| 02 Before You Fly — Prep & Run-Up | 07 Ground Reference Maneuvers |
| 03 Takeoffs & Landings | 08 Collision, Wake & Windshear |
| 04 Airwork — Turns, Climbs, Descents | 09 Emergencies & Engine-Out |
| 05 Slow Flight & Stalls | 10 V-Speeds, Standards & Sign-Off |

01 THE 15 REQUIRED MANEUVERS

Before you fly alone, 14 CFR 61.87(d) requires that you receive and log flight training in fifteen specific maneuvers and procedures, and that your instructor find you proficient and safe in each. This guide walks through all fifteen, tailored to your 172M and Bourland Field. The table below shows where each one lives.

#	61.87(D) MANEUVER / PROCEDURE	COVERED IN
1	Flight preparation — preflight, powerplant, systems	§02
2	Taxiing / surface operations, including run-ups	§02
3	Takeoffs & landings — normal and crosswind	§03
4	Straight-and-level flight; turns both directions	§04
5	Climbs and climbing turns	§04
6	Airport traffic patterns — entry & departure	§06
7	Collision, windshear & wake-turbulence avoidance	§08
8	Descents — high- and low-drag configurations	§04
9	Flight at various airspeeds, cruise to slow flight	§05
10	Stall entries & recovery (first indication and full)	§05
11	Emergency procedures & equipment malfunctions	§09
12	Ground reference maneuvers	§07
13	Approaches to a landing with simulated engine failure	§09
14	Slips to a landing	§06
15	Go-arounds	§06

02 BEFORE YOU FLY — PREP & RUN-UP

You can't fly a good maneuver from a bad setup. The first two items of 61.87(d) are about arriving ready and getting the airplane safely to the runway.

FLIGHT PREPARATION [61.87(D)(1)]

- **You:** run **IMSAFE** (Illness, Medication, Stress, Alcohol, Fatigue, Emotion/Eating). Carry your student pilot certificate, medical, and photo ID, plus your logbook with a current 90-day solo endorsement.
- **The airplane:** confirm **ARROW** documents and that required inspections are current (**AVIATE**); preflight the airframe per the checklist; sump fuel and check for the right color (100LL, blue), no water, no debris.

- **Powerplant & systems:** the carbureted O-320 is gravity-fed (no fuel pump), fixed-pitch (throttle sets RPM), and runs on two magnetos independent of the electrical system. Plan to use carb heat on descents.
- **Plan:** weather and winds, density altitude, runway in use, weight & balance, and takeoff/landing performance for the day.

TAXIING & RUN-UP [61.87(D)(2)]

- Check brakes as soon as you roll; taxi at a fast walk; steer with rudder pedals, brakes only as needed.
- Position the controls for wind — in the high-wing 172, *climb into* a headwind quartering, *dive away* from a tailwind quartering.
- Run up into the wind on a firm surface; verify mag drop within limits and no excessive split, carb-heat drop, suction, ammeter, idle, and flight controls free and correct.

PRE-TAKEOFF FLOW — LIGHTS, CAMERA, ACTION

Lights — landing light, strobes/anti-collision, and nav lights on for departure · **Camera** — transponder to ALT (code set, ADS-B on) · **Action** — the last items before you roll: flaps set, mixture rich (lean for density altitude), carb heat cold, fuel on BOTH, trim set, controls free, doors and windows latched. Run it the same way every time, lined up on the centerline after your run-up.

03 TAKEOFFS & LANDINGS

Normal and crosswind takeoffs and landings are the heart of pattern work and the maneuvers you'll repeat most on solo. Fly each leg on speed and on centerline.

NORMAL & CROSSWIND TAKEOFF

- Smoothly apply full power, check RPM and oil, keep straight with **right rudder** (counters the left-turning tendencies — TPSG).
- Rotate about **63 MPH**; climb at **Vy ≈ 84 MPH** (use **Vx ≈ 68 MPH** only to clear an obstacle).
- **Crosswind:** full aileron into the wind at the start of the roll, reducing as speed builds; stay on centerline with rudder; lift off slightly late, then crab to track the centerline.

NORMAL & CROSSWIND LANDING

- Fly a stabilized approach on speed; round out and hold the airplane off, touching down on the mains at minimum speed with the nose high.
- **Crosswind (wing-low):** lower the upwind wing with aileron and hold the nose straight with opposite rudder; touch down on the upwind main first; keep aileron into the wind through rollout.

PRE-LANDING FLOW — GUMPS

Gas (BOTH, sufficient) · **Undercarriage** (fixed — confirmed down) · **Mixture** rich · **Prop** (fixed-pitch — n/a) · **Switches/Seatbelts.** A habit worth keeping even in a fixed-gear airplane.

04 AIRWORK — TURNS, CLIMBS, DESCENTS

Straight-and-level, turns, climbs, and descents are the building blocks 61.87(d)(4), (5), and (8) ask for. Smooth, coordinated, on altitude and heading.

STRAIGHT-AND-LEVEL & TURNS

- Trim away control pressure; hold heading $\pm 10^\circ$ and altitude ± 100 ft using outside references cross-checked with the instruments.
- Clear the area, then roll into a coordinated turn (ball centered, $\sim 30^\circ$ bank for training); add slight back-pressure to hold altitude; lead the rollout by about half the bank angle.

CLIMBS & CLIMBING TURNS

- Pitch for the target speed ($V_y \approx 84$ MPH for rate, $V_x \approx 68$ MPH for angle); hold right rudder; keep turns shallow-to-medium and coordinated.
- Lead the level-off by about 10% of the climb rate, lower the nose, let speed build, then set cruise power and trim.

DESCENTS — HIGH- AND LOW-DRAG

- **Low-drag (clean):** reduce power, lower the nose for the target speed — good for covering distance.
- **High-drag:** add flaps (below $V_{fe} \approx 98$ MPH) for a steeper path at a lower speed.
- Apply carb heat during reduced-power descents; control airspeed with pitch and rate with power.

05 SLOW FLIGHT & STALLS

Items (9) and (10): operate comfortably from cruise down to the edge of a stall, recognize the stall, and recover promptly. A wing always stalls at the same critical angle of attack — at any airspeed or attitude.

SLOW FLIGHT

- Establish flight just above the first indications of a stall while holding altitude, heading, and coordination. Expect a high pitch attitude, high power, mushy controls, and a lot of right rudder.
- Practice clean and with flaps; transition smoothly to and from cruise.

172M setup (target ~ 60 mph, 30° flaps):

- | | |
|---|--|
| 1 | Run your CRAC pre-maneuver check (clearing turns + setup); carb heat ON . |
| 2 | Power back to $\sim 1,500$ RPM ; pitch to hold altitude as the airspeed decreases. |
| 3 | Once in the white arc , add flaps in 10° increments to 30° . |
| 4 | Restore power to $\sim 2,000$ RPM ; hold heading and altitude, targeting ~ 60 mph . |

POWER-OFF STALL

Simulates an approach-to-landing stall. **172M steps:**

1	Begin from slow flight ; reduce power to ~1,500 RPM .
2	Establish a stabilized, simulated-landing descent .
3	Power to idle ; hold the nose above the horizon .
4	Acknowledge the stall horn and let the stall develop.
5	Recover: lower the nose, add full power , carb heat OFF .
6	Airspeed stable and a positive rate — retract flaps 10° at a time while holding a stable climb.

POWER-ON STALL

Simulates a departure/takeoff stall — expect a strong left yaw, so lead with right rudder. **172M steps:**

1	Run your CRAC pre-maneuver check; carb heat ON .
2	Power to idle ; hold the nose level to bleed airspeed to ~60 mph .
3	Add full power ; pitch up to ~20° nose-up ; right rudder to maintain heading.
4	Let the stall develop.
5	Recover: lower the nose, keep full power , and establish a stable climb.

STALL RECOVERY — THE UNIVERSAL PRIORITY

Whatever the configuration, the recovery order never changes:

1	Reduce angle of attack — lower the nose. This breaks the stall; nothing else matters until you do.
2	Add full power smoothly, right rudder to stay coordinated.
3	Level the wings with coordinated aileron and rudder — don't pick up a wing with aileron alone near the stall.
4	Return to a climb , retracting flaps in stages per the POH as speed builds. Minimize altitude loss.

Practice recovering both at the **first indication** (buffet/horn) and from a **fully developed** stall.

PRIVATE PILOT ACS STANDARDS

These are the checkride tolerances your DPE will hold you to (Private Pilot ACS, Area of Operation VII). Tolerances are published in knots; on your MPH panel, **+10/−0 kt ≈ +12/−0 mph**.

TASK	STANDARD & TOLERANCES
Maneuvering During Slow Flight	Complete no lower than 1,500 ft AGL . Hold an airspeed just above the stall warning (no horn/buffet during the maneuver). Fly coordinated straight-and-level, turns, climbs, and descents within: altitude ±100 ft , heading ±10° , bank ±10° of that specified, airspeed +10/−0 kt .
Power-Off Stalls	Complete no lower than 1,500 ft AGL . Approach/landing configuration from a stabilized descent. Heading ±10° straight; bank 20° max (±10°) turning. Acknowledge the cues, recover promptly after a full stall per the POH, then accelerate to V_X/V_Y and return to assigned altitude/heading.
Power-On Stalls	Complete no lower than 1,500 ft AGL . Takeoff/departure configuration with power ≥65% available. Heading ±10° straight; bank 20° max (±10°) turning. Recover promptly after a full stall per the POH, then accelerate to V_X/V_Y .
Spin Awareness	Knowledge and risk management only — no in-flight spin demonstration on the single-engine private practical test.

NOTE – FIRST INDICATION VS. FULL STALL

Your pre-solo training under 61.87(d)(10) has you recover at the **first indication** of a stall *and* from a full stall. The ACS checkride goes further and requires you to ride it to a **fully developed stall** and then recover — smooth, coordinated control inputs throughout, not abrupt.

06

PATTERN, GO-AROUNDS & SLIPS

Items (6), (15), and (14). At non-towered Bourland you are your own controller — fly a square, predictable pattern, announce on CTAF 123.0, and keep your scan outside.

TRAFFIC PATTERN [61.87(D)(6)]

- Left traffic is standard; pattern altitude ≈ **1,000 ft AGL (≈1,870 ft MSL)** at 50F — confirm direction per runway in the Chart Supplement.
- Enter the downwind at 45° to the midpoint; abeam the touchdown point reduce power and add the first flaps; add flaps on base and final as planned and fly the approach on speed.
- Bookend each CTAF call with the field name; keep legs square and spacing consistent every lap.

GO-AROUNDS [61.87(D)(15)]

- Decide early. The moment the approach is unstable or the runway isn't assured: **full power**, pitch to a positive climb, hold right rudder.
- Retract flaps **in stages** (not all at once); sidestep to the right to keep traffic in sight; climb at V_x/V_y and rejoin the pattern. A go-around is good judgment, not a failure.

SLIPS TO A LANDING [61.87(D)(14)]

- A forward slip adds drag to steepen the descent without gaining speed when you're high on final.
- Lower a wing with aileron, hold opposite rudder, control speed with pitch, and align with the runway before touchdown.
- **172M note:** avoid a full slip with full flaps per the POH — follow that limitation.

07 GROUND REFERENCE MANEUVERS

Item (12) builds the wind-correction instinct you'll use on every pattern: hold a constant ground track by varying your bank angle as the wind pushes you around the turn. The same rule drives every variation — **bank steepest where groundspeed is highest (downwind), shallowest where it is lowest (into the wind)**.

URNS AROUND A POINT

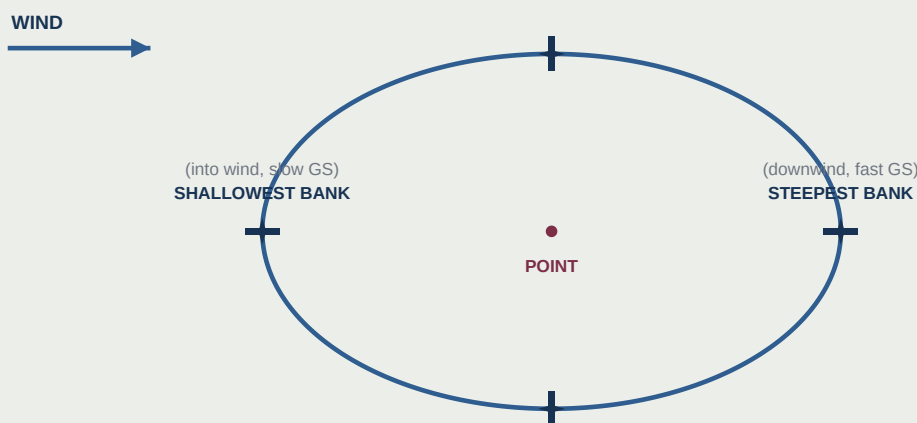


Fig 7.1 Turns around a point. Groundspeed is highest on the downwind side, so bank is **steepest** there and **shallowest** on the upwind side, with continuous adjustment through the crosswind segments. The goal is a constant-radius ground track despite the wind. The rectangular course applies the same wind-correction logic. Fly at a safe altitude (≈ 600 – $1,000$ ft AGL – confirm with your CFI) and clear the area first.

- Divide attention between the ground track, altitude and airspeed, and coordination.
- Steepen the bank as groundspeed increases (downwind), shallow it as groundspeed decreases (upwind); crab on the crosswind legs to hold the track.

S-TURNS ACROSS A ROAD

Fly a series of **equal-size half-circles** on alternating sides of a straight road or section line, crossing the road each time with the **wings level** and the nose perpendicular to it. With the wind blowing perpendicular to the road, each crossing has you headed directly up- or downwind — so your bank must already be changing the instant you roll in.

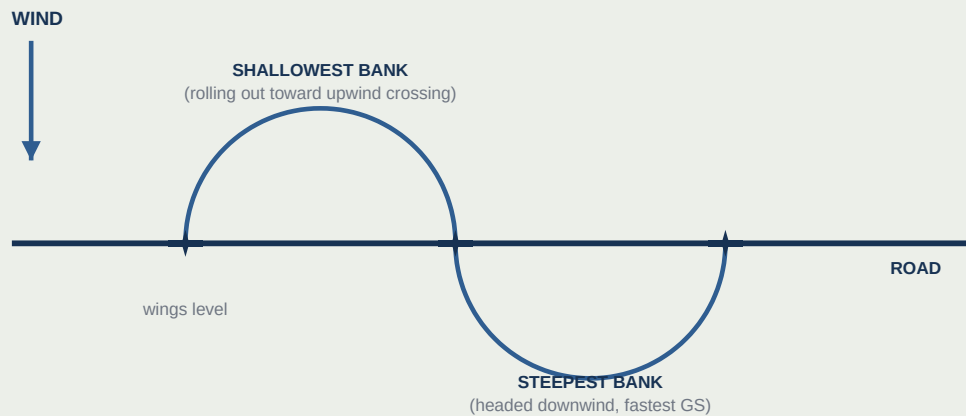


Fig 7.2 S-turns across a road. Each half-circle is the **same radius**, and the airplane crosses the road wings-level and perpendicular. Bank is **steepest** right after crossing while headed downwind (highest groundspeed) and **shallowest** as the turn swings back toward the upwind crossing. Reverse the turn at each crossing. Same altitude and clearing-turn rules as Fig 7.1.

- Roll into the steepest bank immediately as you cross the road headed downwind, then shallow it progressively as the turn brings you back toward the upwind crossing.
- Keep every half-circle the same size, hold altitude, and arrive back at the road wings-level and perpendicular before reversing into the next turn.

08 COLLISION, WAKE & WINDSHEAR

Item (7): see and avoid is your job, day VFR. The high wing blocks the inside of a turn — raise the wing and clear before you roll.

COLLISION AVOIDANCE

- Continuous outside scan; clearing turns before maneuvers; position reports on CTAF; lights on.
- Right-of-way basics (91.113): converging same category — aircraft on the right has it; head-on — both turn right; overtaking — pass well clear to the right; aircraft on final/landing have the right of way.

WAKE TURBULENCE

- Wake sinks and drifts downwind. Behind a larger airplane: stay at or above its path and land beyond its touchdown point; on departure, rotate before its rotation point and climb above its path.

WINDSHEAR

- Suspect it near gust fronts, thunderstorms, and frontal passages. Add roughly half the gust spread to your approach speed and be ready to go around.

EMERGENCIES & ENGINE-OUT

Items (11) and (13). In any emergency: **fly the airplane first**, then troubleshoot, then communicate. Memorize the flow; the checklist confirms it.

ENGINE FAILURE — A·B·C·D·E

A	Airspeed — pitch immediately for best glide, $\approx$ 75 MPH in the 172M.
B	Best field — pick a site into the wind and commit early.
C	Checklist / cockpit — fuel selector BOTH, mixture RICH, carb heat ON, mags BOTH (try START), primer in & locked. (No fuel pump — it's gravity-fed.)
D	Declare — squawk 7700, call on the current frequency or 121.5, "Mayday."
E	Execute / egress — secure the engine (fuel/mags/master off before touchdown), brace, exit and get clear.

COCKPIT FLOW — FLOOR TO DOOR, DOOR TO FLOOR

Floor → **Door** (attempt the restart — start at the fuel on the floor and work up and out, turning things *on*): fuel selector (floor) BOTH / fullest tank · primer in & locked · mixture RICH · carb heat ON · throttle set · mags BOTH, then try START · master ON (BAT & ALT) · doors & windows latched.

Door → **Floor** (no restart — secure for the forced landing, work from the door down to the floor, turning things *off*): doors unlatched and cracked for egress · flaps as needed, then master OFF · mags OFF · throttle idle · mixture IDLE CUTOFF · fuel selector OFF · fuel shutoff OFF · seatbelts/harness tight.

APPROACHES WITH SIMULATED ENGINE FAILURE [61.87(D)(13)]

- Hold best glide, pick a touchdown point, and fly a high "key-point" approach to it; run the flow while you fly.
- Use flaps and a slip to **lose** excess altitude — **don't stretch the glide**. Aim to arrive slightly high and bleed it off.

OTHER MALFUNCTIONS TO KNOW

Alternator failure (shed load, engine runs on the mags, watch the ammeter/low-volts light) · engine fire (POH flow: mixture idle cutoff, fuel off, master off) · carburetor ice (full carb heat) · lost/disoriented solo — the **5 C's**: Climb, Communicate, Confess, Comply, Conserve.

V-SPEEDS, STANDARDS & SIGN-OFF

Your target speeds (1976 172M, in **MPH** to match an MPH panel; airframe limits are unchanged by the 160-hp STC). Learn these for your tail number and confirm them on your actual instrument.

V_{SO} 46 Stall, landing config (mph)	V_{S1} 51 Stall, clean (mph)	V_R ~63 Rotate (mph)	V_X 68 Best angle of climb (mph)
V_Y 84 Best rate of climb (mph)	Glide 75 Best glide (mph)	V_A 112 Maneuvering @ 2,300 lb	V_{FE} 98 Max flaps (115 @ 10°)

MANEUVER STANDARDS (PROFICIENT WHEN...)

- Takeoffs/landings: stabilized, on-speed approaches; touchdowns on centerline in the touchdown zone with positive directional control.
- Airwork: altitude ± 100 ft, heading $\pm 10^\circ$, coordinated throughout; correct climb/descent speeds.
- Slow flight & stalls: recognize and recover promptly with minimum altitude loss, no secondary stall or spin entry.
- Ground reference: constant ground track and altitude with smooth wind correction.
- Emergencies: fly best glide first, pick a field, run the flow, stay calm and methodical.

PRE-SOLO SIGN-OFF TRACKER

#	MANEUVER / PROCEDURE [61.87(D)]	DATE / CFI INITIALS
1	Flight preparation (preflight, powerplant, systems)	
2	Taxiing / surface operations, including run-ups	
3	Takeoffs & landings — normal and crosswind	
4	Straight-and-level; turns both directions	
5	Climbs and climbing turns	
6	Traffic patterns — entry & departure	
7	Collision, windshear & wake avoidance	
8	Descents — high- and low-drag	
9	Flight at various airspeeds to slow flight	
10	Stall entries & recovery	
11	Emergency procedures & malfunctions	
12	Ground reference maneuvers	
13	Approaches with simulated engine failure	
14	Slips to a landing	

BEFORE YOUR FIRST SOLO

Pass the pre-solo knowledge test, confirm the 61.87(c) flight-training endorsement (good 90 days) and the make-and-model endorsement on your student certificate, meet your Part 61 student limitations, and brief the planned solo and personal minimums with your instructor.



HARBOUR AVIATION

STUDY SMART, FLY SAFE.

Prepared by **Adam Fields, CFI-I**

This guide is a study aid built around the 1976 Cessna 172M (Avco Lycoming O-320-E2D, uprated to 160 hp per STC) and 14 CFR 61.87(d). It does not replace your aircraft's POH/AFM, STC supplements, the current Federal Aviation Regulations, the FAA Airplane Flying Handbook / Pilot's Handbook of Aeronautical Knowledge, or the instruction of your CFI. Verify all aircraft-specific numbers, airspeed-indicator markings, and limitations against your airplane's documents, and follow your instructor's solo limitations.