HARBOUR AVIATION

FLIGHT TRAINING · FORT WORTH

PRIVATE PILOT TRAINING • PRE-SOLO KNOWLEDGE REVIEW

PRE-SOLO GROUND STUDY GUIDE

Everything you need to know cold before your instructor signs you off to fly the pattern alone. Built around 14 CFR 61.87, your 1976 Cessna 172M, and Bourland Field.

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

HOME FIELD: BOURLAND 50F • RWY 17/35

REGS: FAA / 14 CFR

DAY VFR • LOCAL PATTERN

WHAT YOU'LL COVER

01 THE SOLO & FAR 61.87

A first solo means you fly the aircraft alone, around the traffic pattern, with no instructor on board. Before that happens, the regulation that governs you is **14 CFR 61.87**.

WHAT 61.87 REQUIRES OF YOU

- You must have received and logged **ground and flight training** for the maneuvers and procedures in 61.87.
- You must **pass a pre-solo written knowledge test** given and graded by your instructor, covering: the applicable Federal Aviation Regulations, the airspace and procedures for your training airport, and the flight characteristics and operating limitations of the make and model you'll fly.
- You must demonstrate the required maneuvers to your instructor and be proficient and safe.
- You must hold a **student pilot certificate** and a current **medical certificate**.

ENDORSEMENTS YOU NEED

Two logbook endorsements before solo: (1) a **pre-solo aeronautical knowledge** endorsement after you pass the written test, and (2) a **solo flight** endorsement for your make and model, which must be renewed every **90 days**. Your instructor must also be present at the airport and authorize each solo flight.

CARRY IT ON EVERY SOLO

Your solo endorsement lives in your **logbook**, so bring the logbook (with the current 90-day endorsement) on every solo flight — along with your **student pilot certificate**, **government photo ID**, and **medical certificate**. On solo *cross-country* flights this is spelled out: 14 CFR 61.51(i)(2) requires you to carry your logbook and student pilot certificate in the aircraft as evidence of your instructor's clearances and endorsements.

REQUIRED MANEUVERS YOU MUST BE ABLE TO FLY

Normal and crosswind takeoffs and landings, traffic pattern operations, straight-and-level flight, climbs and descents, turns to a heading, slow flight, stall recognition and recovery, go-arounds, emergency procedures and equipment malfunctions, ground reference maneuvers, and collision/wake-turbulence avoidance.

02 REGULATIONS & DOCUMENTS

Two questions an examiner or instructor loves: "Is the airplane legal to fly?" and "Are *you* legal to fly?" You answer both with acronyms.

DOCUMENTS THE AIRCRAFT MUST CARRY — ARROW

A	**AIRWORTHINESS CERTIFICATE** — must be displayed, visible to crew/passengers. Has no expiration as long as the aircraft is maintained.
R	**REGISTRATION CERTIFICATE** — current, in the aircraft.
R	**RADIO STATION LICENSE** — only required for *international* operations.
O	**OPERATING LIMITATIONS** — the POH/AFM, plus placards and markings in the cockpit.
W	**WEIGHT & BALANCE** — current data for the specific aircraft.

DOCUMENTS YOU (THE PILOT) MUST CARRY

- Your **student pilot certificate**.
- A current and appropriate **medical certificate**.
- A **government-issued photo ID**.

STUDENT PILOT LIMITATIONS (14 CFR 61.89)

As a student pilot acting as pilot in command, you **may not**:

- Carry passengers, or carry property/cargo for hire.
- Fly for compensation or hire, or in furtherance of a business.
- Fly when flight or surface visibility is less than **3 statute miles** in the daytime (5 SM at night).
- Fly without **visual reference to the surface** (you cannot fly on top of a cloud layer).
- Fly an international flight (with limited exceptions), or in a manner contrary to any limits your instructor placed in your endorsements.

INSPECTIONS — AV1ATE

For the aircraft to be airworthy, required inspections must be current: **A**nnual (12 calendar months), **V**OR check (30 days, if IFR), **100**-hour (if flown for hire/instruction-for-hire), **A**ltimeter/pitot-static (24 months, if IFR), **T**ransponder (24 months), **E**LT battery (replace at 1 hr cumulative use or 50% of useful life). For your local day-VFR solo, the **annual** and **100-hour** (your school's rental) are the ones that matter most.

REQUIRED EQUIPMENT FOR VFR DAY — 14 CFR 91.205(B)

Even with the documents and inspections current, the airplane must have the right instruments and equipment *installed and working* for the flight. For VFR by day, 14 CFR 91.205(b) lists them — memorized as **ATOMATOFLAMES**:

A	**ANTI-COLLISION LIGHTS** — aviation red or white (required on small airplanes certificated after Mar 11, 1996).
T	**TACHOMETER** for each engine.
O	**OIL PRESSURE GAUGE** for each engine using a pressure system.
M	**MANIFOLD PRESSURE GAUGE** for each altitude (turbocharged) engine.
A	**ALTIMETER**.
T	**TEMPERATURE GAUGE** for each liquid-cooled engine.
O	**OIL TEMPERATURE GAUGE** for each air-cooled engine.
F	**FUEL GAUGE** showing the quantity in each tank.
L	**LANDING GEAR POSITION INDICATOR** (if retractable gear).
A	**AIRSPEED INDICATOR**.
M	**MAGNETIC COMPASS** (magnetic direction indicator).
E	**ELT** — emergency locator transmitter (per 91.207).
S	**SAFETY BELTS** for each occupant (plus a shoulder harness at the front seats on airplanes made after Jul 18, 1978).

HOW IT MAPS TO YOUR 172M

It's **air-cooled**, so you carry an *oil temperature* gauge (no coolant-temp gauge); **normally aspirated**, so no manifold pressure gauge is required; and **fixed-gear**, so no landing-gear position indicator. Everything else on the list applies.

NIGHT ADDS FLAPS — 91.205(C)

For VFR at *night*, add **F**uses (a spare set) or circuit breakers, a **L**anding light (if flown for hire), **A**nti-collision lights, **P**osition (navigation) lights, and a **S**ource of electrical power. Your solo flying is day VFR, but know the night list exists.

INOPERATIVE INSTRUMENTS & EQUIPMENT — 14 CFR 91.213

A broken item doesn't automatically ground the airplane — 91.213 sets the process for deciding whether you may legally fly with it inoperative. First question: does the aircraft have an approved **Minimum Equipment List (MEL)**? Most trainers like your 172M do *not*, so you'll use the **91.213(d)** path below.

Under 91.213(d), an inoperative item may stay inop only if it is **not** required by any of these:

1. The **VFR-day type-certificate** equipment list (what the airplane was certificated with).
2. The aircraft's **equipment list** or **Kinds of Operations Equipment List (KOEL)**.
3. **§91.205** (or any other rule) for the kind of flight you're making.
4. An **Airworthiness Directive (AD)**.

If the item clears all four, you may fly once it is:

- **Removed** (cockpit control placarded, logged per §43.9) *or* **deactivated and placarded "INOPERATIVE."**
- Judged **not a hazard** to the aircraft by an appropriately rated pilot or a mechanic.

IF IT'S REQUIRED — DON'T GO

If the inoperative item *is* on any of those four lists (or you're not sure), the airplane isn't airworthy for the flight. Get it repaired, or — for repositioning only — obtain a **special flight permit** (ferry permit) under 91.213(e)/21.197.

FOR YOUR SOLO

As a student, the expected answer is simple: if something's inoperative, **squawk it** and don't fly until your instructor or maintenance signs it off. The placard-and-go judgment call belongs to your CFI or an A&P, not to you alone.

03 AIRCRAFT & SYSTEMS

You can't troubleshoot what you don't understand. Know how your trainer makes power, gets fuel, generates electricity, and tells you what it's doing. The numbers below are for the **1976 Cessna 172M (Lycoming O-320-E2D, uprated to 160 hp per STC) — always confirm against your aircraft's POH and STC supplement.**

THE FLIGHT INSTRUMENTS — "THE SIX-PACK"

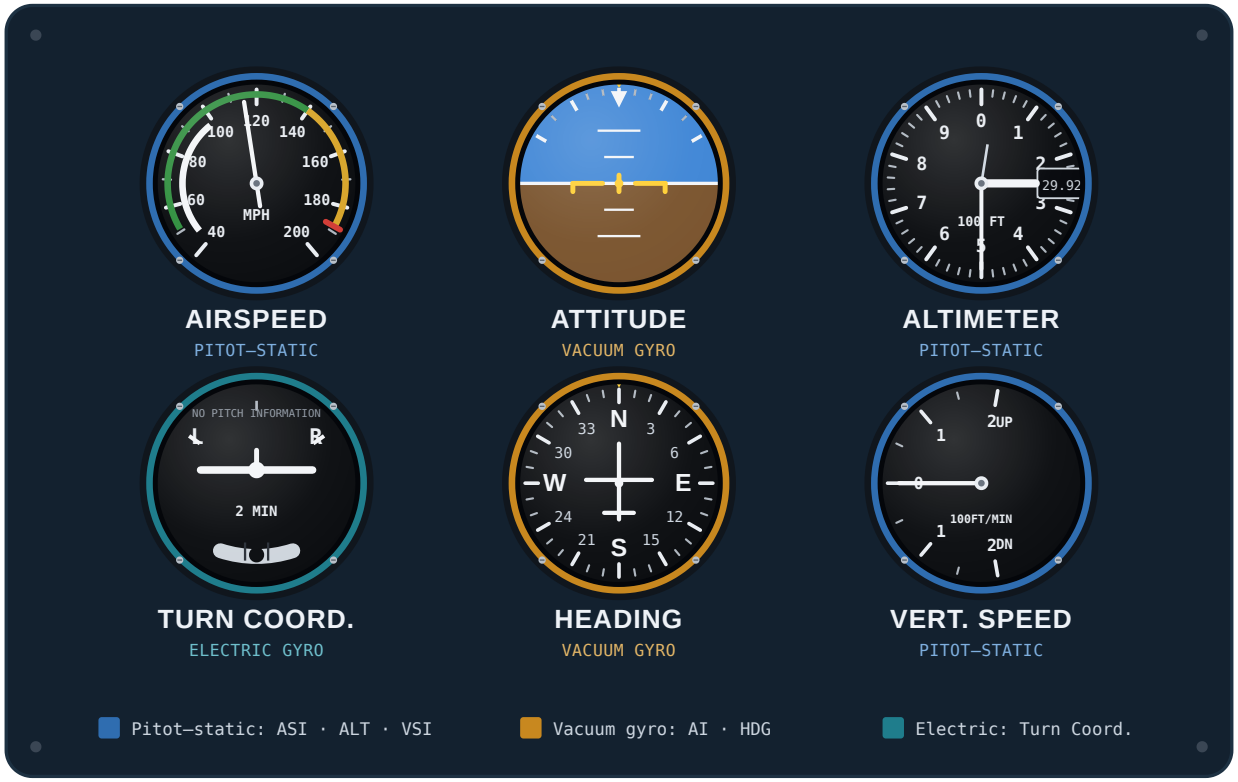

Fig 3.1 The standard six-pack, shown in a coherent snapshot — **straight & level cruise:** ~115 MPH, 2,500 ft, heading north, wings level, ball centered, VSI zero. Learning to *cross-check* that the instruments agree is a core scan skill. Color marks the power source and which instruments fail together: a **vacuum-pump failure** takes out the Attitude and Heading indicators; a blocked **pitot/static system** affects Airspeed, Altimeter and VSI; the **electric Turn Coordinator** keeps running as a backup. (Airspeed in MPH.)

INSTRUMENT	POWERED BY	TELLS YOU
Airspeed Indicator	Pitot + static	Speed through the air (ram vs. static pressure)
Altimeter	Static	Altitude (aneroid expands as pressure drops)
Vertical Speed Indicator	Static (calibrated leak)	Rate of climb/descent
Attitude Indicator	Gyro (vacuum/electric)	Pitch & bank relative to horizon
Heading Indicator	Gyro	Heading (set to the magnetic compass)
Turn Coordinator	Gyro (electric)	Rate of turn + quality (ball = coordination)

POWERPLANT & IGNITION

Your 172M is powered by the **Avco Lycoming O-320-E2D**: a normally-aspirated, direct-drive, air-cooled, horizontally-opposed, **carbureted** four-cylinder engine of 320 cubic inches. From the factory it was rated at 150 hp; yours has been **uprated to 160 hp at 2,700 RPM under a 160-hp STC** (commonly the RAM 160 STC, which fits new cylinders, pistons, and a carburetor and re-pitches the propeller — still a fixed-pitch prop, still carbureted). Ignition is provided by **two independent magnetos** (left and right). Each magneto fires one of the two spark plugs per cylinder. This gives you **redundancy** (either mag can run the engine) and a **more complete, even burn** (better performance). During run-up you check each mag individually — an RPM drop is normal; an *excessive* drop or a rough/dead mag is a no-go.

WHAT THE 160-HP STC DOES (AND DOESN'T) CHANGE

A power STC improves **climb rate and takeoff performance** and slightly raises cruise. It does *not* change the airframe limits — **V_{NE}, V_{NO}, V_A, V_{FE}, stall speeds, gross weight, and best glide stay the same** as the stock 172M. Climb speeds (V_X/V_Y) may be revised slightly; use the figures in your **STC's flight manual supplement**, which legally becomes part of your POH.

CARBURETOR ICE

Your 172M's O-320 is carbureted, so this applies directly: fuel vaporization and pressure drop in the carburetor can form ice even on warm days, especially at low power with high humidity. Symptom in a fixed-pitch prop: a gradual, unexplained **RPM loss**. Fix: apply full **carb heat** (RPM may drop further, then recover/rise as ice melts). On the 172M, expect to use carb heat on every descent and approach.

FUEL SYSTEM

The high-wing 172M is **gravity-fed** — fuel flows down from the wing tanks, so there is **no fuel pump** (neither engine-driven nor electric); the engine runs on gravity alone. The fuel selector reads `BOTH / LEFT / RIGHT / OFF`; for normal ops it stays on **BOTH**. Standard tanks hold roughly **38 gallons usable**. Use **100LL avgas** (dyed blue) or grade 100 (green) — the 172M is **not** approved for auto gas (mogas) without a specific STC. During preflight, sump every drain and check the sample for the right color, no water (clear droplets/bubbles that sink), and no debris.

ELECTRICAL SYSTEM

The 172M uses a **14-volt DC**, single-wire, negative-ground system. The primary source in flight is an engine-driven **14-volt, 60-amp alternator**, which powers the loads and keeps the battery charged. A **12-volt, ~25 amp-hour** lead-acid battery starts the engine and serves as the backup if the alternator quits. System voltage sits a little above battery voltage — about 14 volts with the alternator online — which is what keeps the battery topped off.

Power is controlled by the split **master switch**: the `BAT` half connects the battery, the `ALT` half brings the alternator on line. Loads feed off the bus bar through individual **circuit breakers**, and an **ammeter** plus a **low-voltage warning light** show charging state. If the alternator fails, the light illuminates and you're running on the battery's limited reserve — shed nonessential loads to stretch it. Critically, the **ignition (magnetos) is independent** of this system, so the engine keeps running through a total electrical failure.

172M ELECTRICAL — BY THE NUMBERS

- **System voltage:** 14 V DC (single-wire, negative ground)
- **Alternator:** engine-driven, 14 V, **60 amp** output
- **Battery:** 12 V, **~25 amp-hours** (lead-acid; some airframes carry the larger 35-size battery, ~35 Ah)

Verify the exact figures against your aircraft's POH/equipment list — capacity in particular varies with the battery actually installed.

FLIGHT CONTROLS

Primary controls: **ailerons** (roll, about the longitudinal axis), **elevator** (pitch, lateral axis), **rudder** (yaw, vertical axis). Secondary: **flaps** (increase lift and drag for slower, steeper approaches) and **trim** (relieves control pressure to hold an attitude/airspeed).

04 PRINCIPLES OF FLIGHT

Four forces act on the airplane in flight. In steady, unaccelerated flight the opposing pairs are in balance.

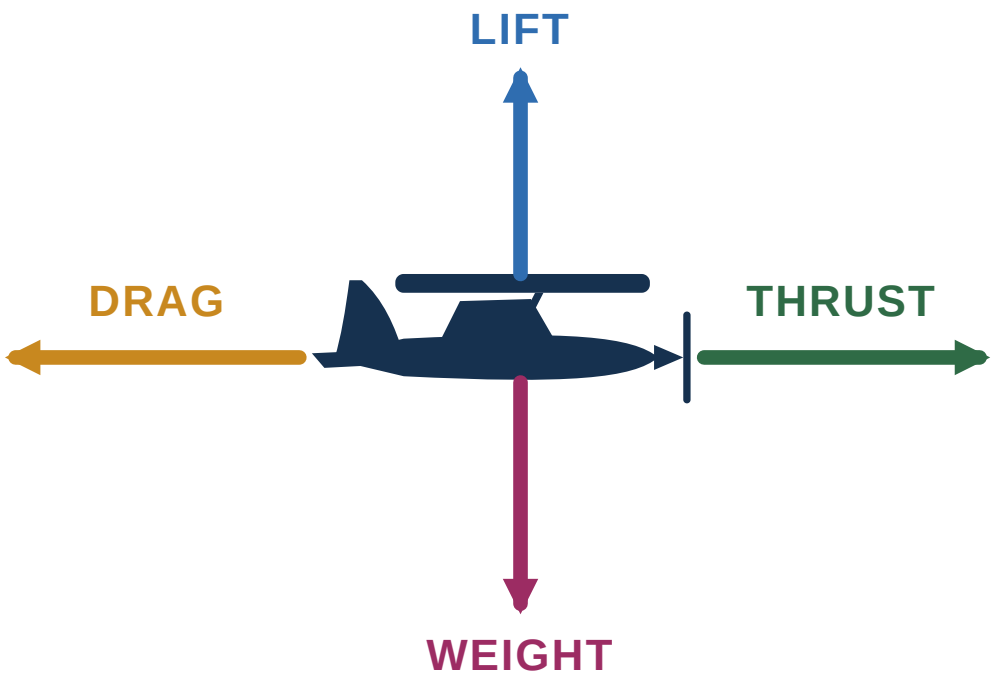

Fig 4.1 The four forces: **Lift** opposes **Weight**, and **Thrust** opposes **Drag**. In steady, level flight the opposing pairs are equal.

LIFT, ANGLE OF ATTACK, AND STALLS

Lift comes from the wing accelerating air over its surface, lowering pressure on top. The key variable you control is **angle of attack (AOA)** — the angle between the wing's chord line and the oncoming air. Lift increases with AOA up to the **critical angle of attack**. Beyond it, airflow separates and the wing **stalls**.

> **THE ONE STALL FACT TO MEMORIZE**
>
> A wing stalls at the **same critical angle of attack every time** — regardless of airspeed, weight, or attitude. You can stall at any airspeed and in any attitude. Recovery: **reduce angle of attack** (lower the nose), add power, level the wings.

LOAD FACTOR

Load factor (G) is the ratio of lift to weight. In level flight it's 1.0 G. In a **level turn**, lift must increase to both hold altitude and turn, so load factor rises: a 60° bank level turn pulls **2 G**, which also raises your stall speed by about 40%. Steep turns near the ground bite student pilots — respect them.

LEFT-TURNING TENDENCIES

At high power and low airspeed (takeoff, climb) the airplane wants to yaw left. Four causes — you correct with **right rudder**:

T	**TORQUE** — engine/prop spin right, airframe reacts left.
P	**P-FACTOR** — at high AOA the descending (right) blade takes a bigger bite, pulling the nose left.
S	**SPIRALING SLIPSTREAM** — prop wash corkscrews back and strikes the left of the tail.
G	**GYROSCOPIC PRECESSION** — pitching the nose up acts 90° ahead, yawing left (most noticeable in taildraggers).

05 V-SPEEDS & PERFORMANCE

V-speeds are airspeeds tied to specific limits or performance. The values below are shown in **miles per hour indicated (MPH)** to match an MPH-marked panel, converted from the 1976 172M's published knots figures. These are **airframe limits — unchanged by the 160-hp STC**. The 172M is still a modestly powered airplane, so don't borrow numbers from a newer or higher-powered 172. Learn yours — and read the next caution carefully.

V_{SO}	V_{S1}	V_R	V_X
46	**51**	**~63**	**68**
Stall, landing config (mph)	Stall, clean (mph)	Rotate (mph)	Best angle of climb (mph)

V_Y	Glide	V_A	V_{FE}
84	**75**	**112**	**98**
Best rate of climb (mph)	Best glide (mph)	Maneuvering @ 2,300 lb	Max flaps (115 @ 10°)

V_{NO}
140
Max structural cruising (mph)

V_{NE}
188
Never exceed (mph)

READ THIS BEFORE TRUSTING THE NUMBERS — MPH VS. KNOTS

1976 is the exact year Cessna switched the 172 to knots, so a 172M can have an airspeed indicator (and POH) in *either* unit. The values above are converted to MPH from the published knots figures (1 kt ≈ 1.15 mph). Two things to verify on *your* airplane: (1) confirm whether your **ASI and your POH** are in mph or knots and never mix the two; and (2) the 172M is well known for **arc markings that sit a bit higher than the converted stall speeds** — on many M-models the bottom of the white arc is painted near 54 mph and the bottom of the green near 61 mph. **The markings on your actual instrument are the authority.** Fly the numbers your CFI gives you for your tail number.

VX VS. VY

Vx = best *angle* — most altitude over the shortest *distance* (clearing obstacles). **Vy** = best *rate* — most altitude in the shortest *time*. Vx is the slower of the two; the two speeds converge as you climb toward the airplane's absolute ceiling.

AIRSPEED INDICATOR COLOR ARCS

ARC	RANGE	MEANING
White	46 → 98 mph	Flap operating range (V_{SO} → V_{FE})
Green	51 → 140 mph	Normal operating range (V_{S1} → V_{NO})
Yellow	140 → 188 mph	Caution — smooth air only (V_{NO} → V_{NE})
Red line	188 mph	Never exceed (V_{NE})

DENSITY ALTITUDE

Density altitude is pressure altitude corrected for non-standard temperature — it's the altitude the airplane "feels." **High, hot, and humid** conditions raise density altitude, which means thinner air: less lift, less thrust, longer takeoff rolls, and weaker climb. The 160-hp STC gives you a margin over a stock 150-hp M, but it's still a light airplane — Texas summers will noticeably stretch your ground roll and flatten your climb. Always run takeoff and landing performance for the actual conditions.

172M KEY LIMITATIONS (POH SECTION 2)

Max gross weight **2,300 lb** • baggage **120 lb** max • normal category load limit **+3.8 / −1.52 G** (no aerobatics, no spins as a normal maneuver) • usable fuel **~38 gal** (standard tanks) • oil **6 qt max / 4 qt min** for flight • max demonstrated crosswind **15 kt**. Confirm every number against your specific aircraft's POH and weight & balance sheet — empty weight and CG are unique to each tail number.

06 WEATHER & VFR MINIMUMS

As a student pilot flying day VFR, you need legal visibility, legal cloud clearance, and the judgment to scrub a flight that doesn't feel right.

BASIC VFR WEATHER MINIMUMS (THE COMMON ONES)

AIRSPACE	VISIBILITY	DISTANCE FROM CLOUDS
Class B	3 SM	Clear of clouds
Class C & D	3 SM	500 below, 1,000 above, 2,000 horizontal
Class E (below 10,000 MSL)	3 SM	500 below, 1,000 above, 2,000 horizontal
Class G (≤1,200 AGL, day)	1 SM	Clear of clouds

MEMORY HOOK — "3 CESSNA 152"

For most of the airspace you'll fly: **3** SM visibility, **1**,000 above, **5**00 below, **2**,000 horizontal. Note your *student* minimum is also **3 SM** day regardless — the more restrictive number always wins.

READING A METAR (DECODE THE BASICS)

A surface observation, e.g. `KAFW 041753Z 18012G20KT 10SM FEW050 31/18 A2992`:

- `KAFW` station, `041753Z` day/time in Zulu (UTC).
- `18012G20KT` wind from 180° at 12 kt, gusting 20.
- `10SM` visibility, `FEW050` few clouds at 5,000 ft AGL.
- `31/18` temp/dewpoint °C, `A2992` altimeter 29.92" Hg.

WIND & CROSSWIND

Compare the wind to the runway heading. The component *across* the runway is your **crosswind**; the component *down* the runway is headwind/tailwind. The 172M's **maximum demonstrated crosswind is 15 knots** — this is a demonstrated value, not a hard limit, and your instructor will set a lower solo cap. Watch the **gust factor** — add roughly half the gust spread to approach speed.

PERSONAL MINIMUMS

Your solo limits will often be tighter than the regulation: a ceiling floor, a wind/gust cap, and a crosswind cap set by your instructor. **The most conservative number always applies.** When in doubt, don't go.

07 AIRSPACE

The classic "upside-down wedding cake." Know which class surrounds your airport, what's required to enter it, and the floors and ceilings around you.

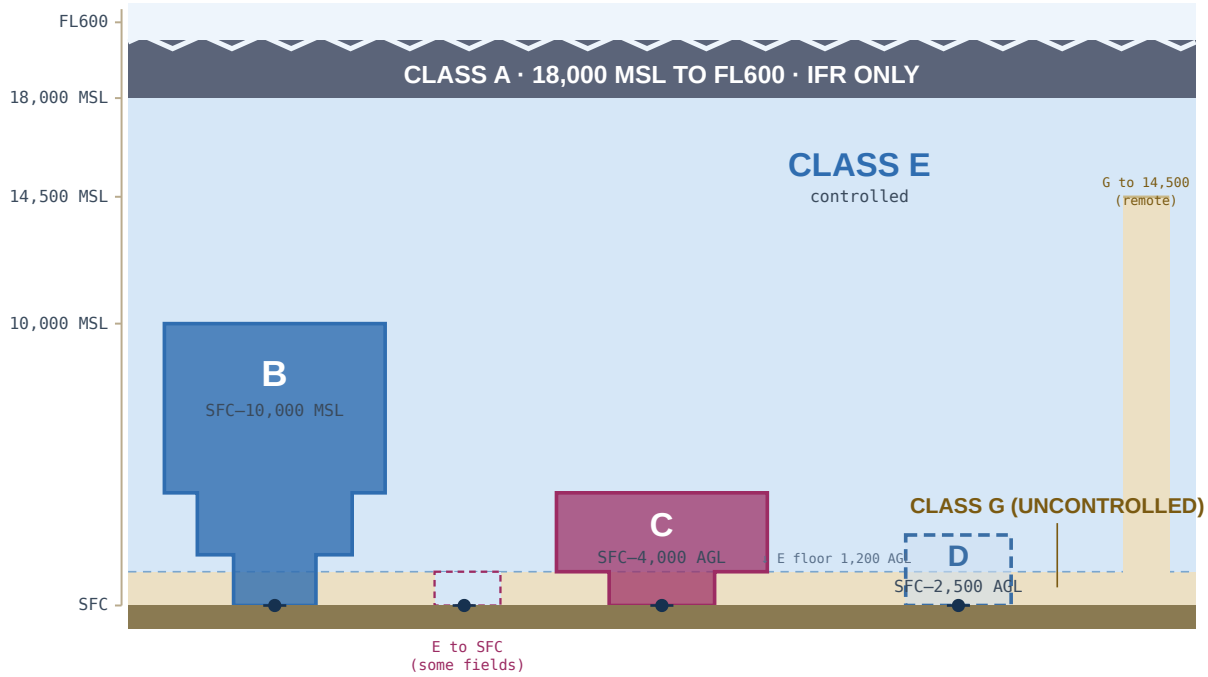

Fig 7.1 Airspace profile with altitudes (left axis is MSL). **Class B** tops at 10,000 MSL in tiers around the busiest airports; **Class C** reaches ~4,000 ft AGL in two tiers; **Class D** (dashed) is a ~2,500-ft-AGL cylinder at towered fields. **Class E** is the controlled airspace from its floor (usually 1,200 ft AGL, sometimes 700 or the surface) up to 18,000 MSL, where **Class A** begins. **Class G** is uncontrolled — only the thin layer below the Class E floor (and up to 14,500 MSL in a few remote areas). Widths are schematic; altitudes are to scale.

CLASS	WHERE	TO ENTER YOU NEED
A	18,000 MSL → FL600	IFR only — not for VFR students
B	Busiest airports, surface → ~10,000	An explicit ATC clearance: *"cleared into the Bravo"*
C	Busy airports, surface → ~4,000 AGL	Two-way radio comms established + Mode C transponder
D	Towered fields, surface → ~2,500 AGL	Two-way radio comms established with the tower
E	Controlled, not A/B/C/D	Nothing for VFR (meet weather minimums)
G	Uncontrolled, near surface	Nothing — but stay clear of clouds & see-and-avoid

"ESTABLISHED COMMUNICATION"

For Class C/D, two-way comms are established when the controller **says your tail number back**. If they say "aircraft calling, standby," you may *not* enter yet. For Class B you need the specific words "cleared into the Bravo."

08 AIRPORT & PATTERN OPERATIONS

The pattern is where you'll spend almost all of your solo time. Fly it the same way every lap: predictable, square, and at the right altitude. Your home field, **Bourland Field (50F)**, is a non-towered single-runway airport — so you are your own controller, and your radio calls and see-and-avoid scan are everything.

BOURLAND FIELD (50F) — KNOW THESE COLD

Field elevation: 873 ft MSL • **Runway:** 17/35, 4,049 ft × 60 ft, asphalt • **CTAF / UNICOM:** 123.0 • **Tower:** none (non-towered) • **Pattern altitude:** ~1,000 ft AGL ≈ **1,870 ft MSL** • **Lighting:** pilot-controlled (MIRL) keyed on CTAF, VASI both ends • **Weather:** no on-field reporting — brief the nearest station (Fort Worth-area AWOS/ASOS) for winds and altimeter. **Airspace:** Class G at the surface, Class E above — check your sectional for the DFW Class B shelves and any nearby airspace. *Confirm the traffic-pattern direction for each runway in the Chart Supplement; never assume.*

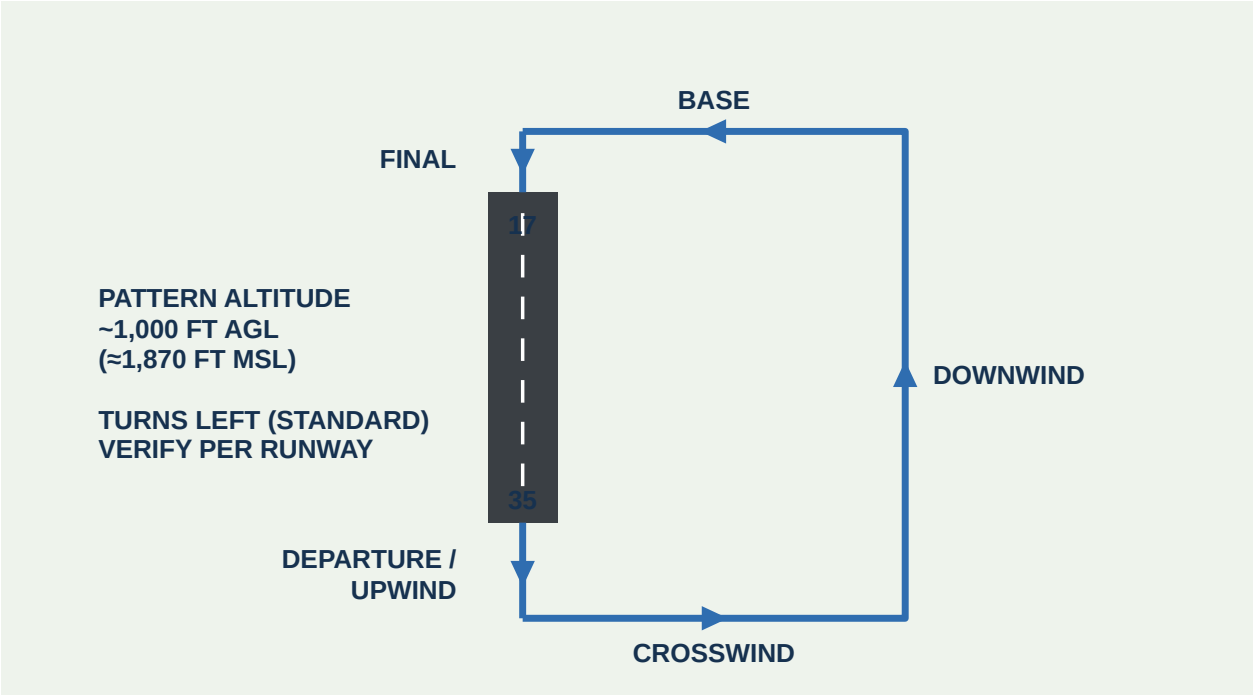

Fig 8.1 Standard **left-hand** pattern shown for Bourland's **Runway 17**. Legs in order: Departure/Upwind → Crosswind → Downwind → Base → Final. Climb to pattern altitude (~1,000 ft AGL, about 1,870 ft MSL at 50F) and report your position at each leg. Left traffic is the default — but always confirm the published direction for the runway in use.

RUNWAY NUMBERING

A runway number is its **magnetic heading rounded to the nearest 10, with the last zero dropped**. Bourland's single runway lies on about **170° magnetic**, so its two ends are **Runway 17** (facing roughly south) and **Runway 35** (facing roughly north) — always 180° apart. Parallel runways add **L / C / R** (left, center, right); 50F has just the one. Always take off and land on the end that points *into* the wind.

RUNWAY MARKINGS & SIGNS

Fig 8.2 White runway markings: threshold bars, the runway designator, dashed centerline, and the fixed aiming-point blocks where you target your touchdown attitude. **Taxiway** markings are yellow.

HOLD-SHORT LINE

The most important marking on the ground: two solid + two dashed **yellow lines** mark the runway hold-short position. **Never cross it onto a runway without a clearance** (towered) or without confirming the runway and approaches are clear (non-towered). Runway incursions are taken extremely seriously.

WIND & FIELD INFORMATION

Use the **windsock** to confirm the active runway and pick the end that points into the wind. Bourland is non-towered, so *you* decide the runway — announce your choice on **CTAF 123.0** and listen for traffic already in the pattern. Since 50F has **no on-field weather reporting**, get your winds and altimeter setting from the nearest reporting station before you taxi. The runway lights are **pilot-controlled** — key the mic on 123.0 to bring them up.

09 RADIO COMMUNICATIONS

Good radio work is just a formula: **Who you're calling, who you are, where you are, what you want.** Brief, clear, in order.

PHONETIC ALPHABET

A Alfa	B Bravo	C Charlie	D Delta	E Echo	F Foxtrot
G Golf	H Hotel	I India	J Juliett	K Kilo	L Lima
M Mike	N November	O Oscar	P Papa	Q Quebec	R Romeo
S Sierra	T Tango	U Uniform	V Victor	W Whiskey	X X-ray
Y Yankee	Z Zulu	0 Zero	9 Niner	3 Tree	5 Fife

NON-TOWERED PATTERN CALLS (CTAF)

Self-announce so others can find you. At **Bourland (50F) on CTAF 123.0**, your calls sound like this (using a sample tail number 1234X):

- `"Bourland traffic, Cessna 1234X, taking runway one-seven for closed traffic, Bourland."` (departure)
- `"Bourland traffic, Cessna 1234X, midfield left downwind, runway one-seven, touch-and-go, Bourland."`
- `"Bourland traffic, Cessna 1234X, turning left base, runway one-seven, Bourland."` • then final • then `"clear of runway one-seven."`
- Bookend every call with the airport name (start and finish) so listeners know which field you mean.

TOWERED FIELD — INITIAL CALL

Listen first, then call. Pattern: *facility, callsign, position/altitude, request/ATIS.*

- `"Tower, Cessna 1234X, ten-mile final... "` — or for ground/taxi: `"Ground, Cessna 1234X at the ramp, taxi for closed traffic, information Bravo."`

READ BACK WHAT MATTERS

Always read back: **runway assignments, hold-short instructions, altitude assignments, and frequency changes**, plus your callsign. If you're unsafe, unsure, or unable, say so — "unable" is a complete answer. When truly in trouble, the words **"Mayday, mayday, mayday"** get you immediate priority.

10 RIGHT-OF-WAY RULES (91.113)

See and avoid is your job, day VFR. When two aircraft conflict, these rules decide who yields — but the pilot with the right of way must still give way to avoid a collision.

- **In distress:** An aircraft in distress has right of way over all others.
- **Converging** (same altitude, different categories): the *least maneuverable* wins — balloon > glider > airship > airplane/rotorcraft > aircraft towing/refueling.
- **Converging, same category:** the aircraft to the **other's right** has the right of way.
- **Head-on: both** aircraft turn **right**.
- **Overtaking:** the aircraft being passed has the right of way; the overtaking aircraft passes well clear to the **right**.
- **Landing:** aircraft on final approach or landing have right of way; of two landing, the **lower** has it — but don't cut in front of one on final.

11 EMERGENCY PROCEDURES

Memorize the flow first, then the checklist. In an emergency: **fly the airplane first**, then troubleshoot, then communicate.

ENGINE FAILURE — FLY THE AIRPLANE: A-B-C-D-E

A	**AIRSPEED** — pitch immediately for **best glide, ~75 MPH** in the 172M.
B	**BEST FIELD** — pick a landing site into the wind; commit early.
C	**CHECKLIST / COCKPIT** — run the restart flow: fuel selector **BOTH**, mixture **RICH**, carb heat **ON**, ignition **BOTH** (then try **START**), primer in & locked. (No fuel pump on the 172M — it's gravity-fed.)
D	**DECLARE** — squawk **7700**, call on **121.5** or current frequency, "Mayday."
E	**EXECUTE / EGRESS** — secure the engine (fuel/mags/master off before touchdown), brace, exit and get clear.

TRANSPONDER EMERGENCY CODES

SQUAWK	MEANS	MEMORY
7500	Hijack	"Five-oh, taken alive"
7600	Lost communications	"Six, can't fix (the radio)"
7700	Emergency	"Seven, going to heaven"

OTHER MALFUNCTIONS TO KNOW

- **Electrical / alternator failure:** reduce electrical load, the engine keeps running on the mags; land and sort it out. Watch the ammeter/low-voltage light.
- **Engine fire on start/in flight:** follow the POH flow — generally mixture to idle cutoff, fuel off, master off; if in flight, consider increasing airspeed to blow it out and land immediately.
- **Lost / disoriented (solo):** the 5 Cs — **Climb, Communicate, Confess, Comply, Conserve**. Climb for radio/radar coverage, tell ATC, ask for help.
- **Go-around:** if the approach isn't stable or the runway isn't clear — full power, pitch for Vx/Vy, retract flaps in stages, fly the pattern again. A go-around is always a good decision, never a failure.

12 AEROMEDICAL FACTORS

You are part of the airworthiness check. Before every flight, run the self-assessment — and know the in-flight hazards that affect your body.

ARE YOU FIT TO FLY? — IMSAFE

I	**ILLNESS** — any symptom that could distract or impair you.
M	**MEDICATION** — prescription or OTC drugs and their side effects.
S	**STRESS** — work, school, life pressure.
A	**ALCOHOL** — the rule is **8 hours bottle-to-throttle**, below 0.04% BAC, and not impaired.
F	**FATIGUE** — the silent killer; rest is not optional.
E	**EMOTION / EATING** — strong emotions and low blood sugar both degrade judgment.

IN-FLIGHT PHYSIOLOGY TO RECOGNIZE

CONDITION	WHAT IT IS	RECOGNIZE / FIX
Hypoxia	Too little oxygen to the body/brain	Headache, euphoria, blue lips/fingernails — descend, use oxygen
Hyperventilation	Breathing out too much CO_2 (often from stress)	Dizziness, tingling — slow your breathing, talk
Spatial disorientation	Senses disagree with reality, esp. without horizon	Trust and fly the instruments, not your gut
Carbon monoxide	CO from a cracked exhaust into cabin heat	Headache, drowsiness — heat off, fresh air, land
Motion sickness	Conflict between motion senses	Fresh air, focus outside, open vents, avoid greasy meals

SCUBA & FLIGHT

If you've been scuba diving, wait before flying so dissolved nitrogen can off-gas: at least **12 hours** after a no-decompression dive (24 hours if it required controlled ascents), to avoid decompression sickness.

13 ACRONYM CHEAT SHEET

Pin these to your kneeboard. If you can rattle these off, you've got most of the pre-solo oral covered.

ACRONYM	FOR	STANDS FOR
ARROW	Aircraft docs	Airworthiness, Registration, Radio (intl), Operating limits, Weight & balance
AV1ATE	Inspections	Annual, VOR, 100-hr, Altimeter/pitot-static, Transponder, ELT
ATOMATOFLAMES	VFR day equip. (91.205b)	Anti-collision, Tach, Oil press., Manifold press., Altimeter, Temp gauge, Oil temp, Fuel gauge, Landing-gear indicator, Airspeed, Mag compass, ELT, Safety belts
FLAPS	VFR night adds (91.205c)	Fuses (spare), Landing light (if for hire), Anti-collision, Position lights, Source of power
IMSAFE	Pilot fitness	Illness, Medication, Stress, Alcohol, Fatigue, Emotion/Eating
TPSG	Left-turn tendencies	Torque, P-factor, Spiraling slipstream, Gyroscopic precession
ABCDE	Engine-out	Airspeed, Best field, Checklist, Declare, Execute/Egress
5 C's	Lost / disoriented	Climb, Communicate, Confess, Comply, Conserve
GUMPS	Pre-landing	Gas, Undercarriage, Mixture, Prop, Switches/Seatbelts (a habit even in fixed-gear)
CIGAR	Pre-takeoff	Controls, Instruments, Gas, Attitude/trim, Run-up/Radio
WIRE / "5 C's of CTAF"	Position reports	Who, what (callsign), where, intentions — bookend with field name

HARBOUR AVIATION

STUDY SMART, FLY SAFE.

This guide is a study aid built around the **1976 Cessna 172M** (Avco Lycoming O-320-E2D, uprated to 160 hp per STC) and FAA regulations. It does not replace your **aircraft's POH/AFM, STC supplements**, the **current Federal Aviation Regulations**, the **FAA Pilot's Handbook of Aeronautical Knowledge / Airplane Flying Handbook**, or the

instruction of your **CFI**. Always verify aircraft-specific numbers and limitations against your airplane's documents, and follow your instructor's solo limitations.