

PRIVATE PILOT GROUND SCHOOL

MODULE 4-4 — CHECKRIDE WEEK 4: TASKS D + E + F

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MNEMONICS

East is least, west is best — Going from true to magnetic, subtract easterly variation and add westerly variation

The sign rule for variation on the heading chain. Read the isogonic line nearest the route: an easterly variation is subtracted from the true heading to get the magnetic heading, a westerly one is added. Say it at the nav log, where the chain is worked, and again on the checkride when the examiner hands you a chart.

The five Cs — Climb, communicate, confess, comply, conserve

The lost procedure in the order it is flown. Climb for the view, the radio, and the radar. Communicate on a charted frequency or 121.5. Confess that you do not know where you are, which the AIM calls an urgency condition the moment it begins. Comply with the vectors. Conserve the fuel by leaning and slowing while the position is rebuilt. The airplane is flown first, before the first C.

FACTS TO REMEMBER

KNOW THESE COLD

- Before every flight, the pilot in command must become familiar with all available information concerning that flight.

Source: 14 CFR 91.103

- For a flight away from the vicinity of an airport, preflight action must include weather reports and forecasts.

Source: 14 CFR 91.103(a)

- For a flight away from the vicinity of an airport, preflight action must include fuel requirements.

Source: 14 CFR 91.103(a)

- For a flight away from the vicinity of an airport, preflight action must include alternatives available if the planned flight cannot be completed.

Source: 14 CFR 91.103(a)

- For every flight, preflight action must include the runway lengths at the airports of intended use.

Source: 14 CFR 91.103(b)

- For every flight, preflight action must include takeoff and landing distance data from the POH/AFM, or other reliable performance information if no AFM is required.

Source: 14 CFR 91.103(b)

- NOTAMs, including TFRs, are part of "all available information" and must be checked before every cross-country flight.

Source: 14 CFR 91.103; AIM 5-1-3

- The VFR sectional chart is the primary planning chart for a private-pilot cross-country; each covers a named

region at 1:500,000 scale.

Source: PHAK ch. 16

- Sectional charts expire on a published 56-day cycle; planning on an out-of-date chart risks missing new towers, frequencies, and airspace.

Source: Aeronautical Chart User's Guide

- Route selection starts with the airspace the route crosses: Class B, C, and D add communication or clearance requirements, and special use airspace must be identified and checked.

Source: PHAK ch. 15–16

- The Chart Supplement is the source for airport details the chart cannot show: runway data, lighting, frequencies, fuel, services, and hours.

Source: Chart Supplement legend

- Route selection weighs emergency options — terrain, airports along the way, and glide range — against the shortest straight line.

Source: PHAK ch. 16

- An EFB may replace paper charts for VFR flight if the pilot verifies the chart and database currency before flight.

Source: AC 91-78

- EFB failure must be planned for: charge state, a backup device or paper chart, and heat/sunlight shutdown risk.

Source: AC 91-78

- Cruising altitude must clear terrain and obstacles along the whole route; the quadrangle MEF on a sectional gives the elevation of the highest feature in that quadrangle.

Source: PHAK ch. 16

- The MEF is not a safe cruising altitude by itself — it carries no buffer; the pilot adds a clearance margin above it.

Source: PHAK ch. 16

- Higher cruising altitude increases glide distance and the number of landable options after an engine failure.

Source: PHAK ch. 16; POH glide data

- In level VFR cruise more than 3,000 ft above the surface, a magnetic course of 0–179° requires an odd-thousand MSL altitude plus 500 ft.

Source: 14 CFR 91.159

- In level VFR cruise more than 3,000 ft above the surface, a magnetic course of 180–359° requires an even-thousand MSL altitude plus 500 ft.

Source: 14 CFR 91.159

- Time en route for a leg equals leg distance divided by groundspeed.

Source: PHAK ch. 16

- Groundspeed is true airspeed corrected for wind: a headwind component lowers it, a tailwind component raises it.

Source: PHAK ch. 16

- Flight-plan times and ETAs are figured in UTC (Zulu); local time converts to UTC by the zone offset, watching the date change.

Source: AIM 4-2-12

- Leg fuel equals leg time multiplied by the POH fuel-burn rate for the chosen power setting.

Source: POH/AFM sect. 5

- Total fuel required is taxi/runup plus climb plus cruise legs plus descent plus the legal reserve — and the tanks' usable fuel must cover all of it.

Source: 14 CFR 91.151; POH

- Day VFR fuel minimum: enough to fly to the first point of intended landing plus 30 minutes at normal cruising speed.

Source: 14 CFR 91.151(a)

- Night VFR fuel minimum: enough to fly to the first point of intended landing plus 45 minutes at normal cruising speed.

Source: 14 CFR 91.151(a)

- The 91.151 reserve is a legal floor, not a plan; North Aero planning sets a larger personal fuel reserve, fixed before flight.

Source: 14 CFR 91.151; personal minimums doctrine

- Usable fuel, not total fuel, is the planning number: unusable fuel cannot reliably reach the engine in flight attitudes.

Source: POH/AFM sect. 2

- A VFR flight plan exists for search and rescue: it tells Flight Service where to look and when to start looking.

Source: AIM 5-1-4

- A VFR flight plan is not required for most VFR flights, but filing one is the cheapest safety net on a cross-country.

Source: AIM 5-1-4

- Filing does not activate a VFR flight plan: the pilot opens it after departure by radio, phone, or EFB link to Flight Service.

Source: AIM 5-1-4

- Closing a VFR flight plan is the pilot's job; tower controllers do not close it for you.

Source: AIM 5-1-14

- If a VFR flight plan is not closed within 30 minutes after ETA, search and rescue procedures begin.

Source: AIM 5-1-14

- An intercepted aircraft follows the interceptor's visual signals: rocking wings from the interceptor means "you have been intercepted — follow me."

Source: AIM 5-6

- If intercepted: maintain a steady course, attempt contact on 121.5 MHz, squawk 7700 if unable to communicate, and notify ATC.

Source: AIM 5-6

- The Pilot leg of PAVE on a cross-country adds duration exposure: fatigue, food and water, and currency for the length and conditions of the trip.

Source: PHAK ch. 2

- The Aircraft leg asks whether this airplane is equipped and legal for this route: avionics, lighting for the arrival time, inspections current, performance adequate.

Source: PHAK ch. 2

- The enVironment leg is evaluated leg by leg — weather, terrain, airspace, and obstacles along the whole route, not just at the endpoints.

Source: PHAK ch. 2

- A reason you "must" arrive is itself a risk factor; the mitigation is alternatives arranged before takeoff — an extra day, a backup ride, a planned alternate.

Source: PHAK ch. 2

- VFR flight following is workload-permitting: ATC can refuse or drop it, and radar and radio coverage have floors — it is a service, not a guarantee.

Source: AIM 4-1-15

- No ATC service relieves a VFR pilot of see-and-avoid, terrain avoidance, or airspace compliance.

Source: AIM 4-1-15; 14 CFR 91.113

- Pilotage is navigation by visible landmarks compared against the chart.

Source: PHAK ch. 16

- Dead reckoning is navigation by computed heading, speed, and time from a known starting point.

Source: PHAK ch. 16

- On a VFR cross-country the two run together: dead reckoning predicts, pilotage confirms — neither alone is the plan.

Source: PHAK ch. 16

- The required foundation for solo cross-country is charts plus pilotage and dead reckoning with a magnetic compass; electronic navigation rides on top of it, never in place of it.

Source: 14 CFR 61.93(e)(1)

- Variation is the angle between true north and magnetic north at your location, shown by isogonic lines on the chart.

Source: PHAK ch. 16

- "East is least, west is best": going from true to magnetic, subtract easterly variation and add westerly.

Source: PHAK ch. 16 (Mnemonic)

- The heading chain runs: true course, plus or minus wind correction gives true heading; plus or minus variation gives magnetic heading; plus or minus deviation gives compass heading.

Source: PHAK ch. 16

- The wind correction angle points the nose into the wind just enough to keep the ground track on the course line.

Source: PHAK ch. 16

- Contour lines and shaded relief show terrain elevation on the sectional; tightly packed contours mean steep terrain.

Source: PHAK ch. 16; Chart User's Guide

- A good checkpoint is unique, visible from cruise altitude, and on or near the course line.

Source: PHAK ch. 16

- Line features crossing the course (rivers, highways, railroads) make natural timing gates; line features parallel to the course confirm track and bound drift.

Source: PHAK ch. 16

- True course is measured with a plotter against a meridian near the midpoint of the leg.

Source: PHAK ch. 16

- True airspeed is calibrated airspeed corrected for density altitude; it rises roughly 2% per 1,000 ft of altitude for the same calibrated airspeed.

Source: PHAK ch. 11

- Planning TAS comes from the POH cruise table for the chosen altitude, power setting, and temperature.

Source: POH/AFM sect. 5

- Cruise power selection trades speed against fuel flow and range; the POH cruise-performance table is the menu.

Source: POH/AFM sect. 5

- The wind side of the flight computer solves wind correction angle and groundspeed from forecast wind, TAS, and true course.

Source: PHAK ch. 16

- Actual groundspeed equals the distance between two checkpoints divided by the time between them.

Source: PHAK ch. 16

- A groundspeed slower than planned recomputes destination fuel first and the schedule second.

Source: PHAK ch. 16

- Off-course corrections are made by visual re-intercept, then a revised heading that holds the track.

Source: PHAK ch. 16

- A VOR broadcasts 360 radials oriented to magnetic north; a radial always points FROM the station.

Source: PHAK ch. 16; AIM 1-1-3

- A VOR must be identified by its Morse (or voice) identifier before use; a missing identifier means the facility is unusable, often for maintenance.

Source: AIM 1-1-3

- With a course set in the OBS, the CDI shows displacement from that course, and the TO/FROM flag shows whether flying the course would take you to or from the station.

Source: PHAK ch. 16

- CDI sensing is correct only when the selected course roughly matches the direction of flight; flying the reciprocal of the selected course gives reverse sensing.

Source: PHAK ch. 16

- To fix position with one VOR: center the needle with a FROM indication — the course window then reads the radial you are on.

Source: PHAK ch. 16

- Radials from two VORs cross at exactly one place: a two-VOR cross-fix is a position without any visual landmark.

Source: PHAK ch. 16

- VOR reception is line-of-sight: range grows with altitude, and terrain can block it down low.

Source: AIM 1-1-3

- GPS position comes from satellite ranging; the receiver needs four satellites for a three-dimensional fix.

Source: AIM 1-1-17; PHAK ch. 16

- RAIM is the receiver's integrity self-check: it detects when a satellite signal cannot be trusted; without RAIM the position is unmonitored.

Source: AIM 1-1-17

- A RAIM-loss or integrity annunciation in flight means the GPS position is unverified: crosscheck it, or revert to pilotage, dead reckoning, or VOR.

Source: AIM 1-1-17

- No regulation requires a current GPS database for VFR, but stale airspace and frequency data is a trap: an out-of-date database must be covered by chart crosscheck.

Source: AIM 1-1-17

- Handheld and tablet GPS are situational-awareness aids only: not certified, not primary navigation, and their failure modes (battery, signal, heat) travel with them.

Source: AC 91-78

- VFR flight following provides traffic advisories and safety alerts, workload permitting; request it from approach or center with position, altitude, and destination.

Source: AIM 4-1-15

- Traffic advisories come as clock positions relative to your ground track — "traffic, two o'clock, five miles" — so the search sector shifts with your wind correction.

Source: AIM 4-1-15

- "Radar service terminated, squawk VFR" ends the service: navigation, terrain, and traffic are all yours again, with no handoff coming.

Source: AIM 4-1-15

- Mode A sends the four-digit squawk; Mode C adds pressure altitude; Mode S adds selective interrogation and data link.

Source: AIM 4-1-20

- Squawk 1200 is VFR; 7500 is hijack, 7600 lost communications, 7700 emergency — and avoid spinning the knobs through them.

Source: AIM 4-1-20

- ADS-B Out broadcasts GPS-derived position and velocity about once a second; it is how modern ATC and equipped aircraft see you.

Source: AIM 4-5-7

- ADS-B In (optional) receives TIS-B traffic and FIS-B weather; TIS-B shows only transponder- or ADS-B-equipped targets with coverage — it never shows every aircraft.

Source: AIM 4-5-7

- If an operable transponder is installed, it runs with altitude reporting whenever airborne in controlled airspace.

Source: 14 CFR 91.215(c)

- Program the navigator before the runway: a mis-set GPS flight plan flown faithfully is the modern way to get lost.

Source: PHAK ch. 16

- In-flight navigation programming is a distraction budget item: aviate first, then navigate — head-down time is scheduled, not stolen.

Source: PHAK ch. 2

- Name the limitation of whatever you navigate by today — VOR line-of-sight, GPS integrity, EFB battery — before flight, not after it bites.

Source: PHAK ch. 16

- On any nav-signal loss (flag, integrity warning, frozen EFB): say it out loud, hold the last crosschecked heading, and rebuild from pilotage and dead reckoning.

Source: PHAK ch. 16

- The lost-procedure spine is the five Cs: climb, communicate, confess, comply, conserve.

Source: AFH (Mnemonic 5 Cs)

- Climbing when lost improves both the view and radio/navaid reception.

Source: AFH

- Position rebuilds from the last known fix: time flown times groundspeed bounds the circle you must be in; then match large features to the chart.

Source: PHAK ch. 16

- A VOR cross-fix or the GPS nearest page resolves position without any visual match at all.

Source: PHAK ch. 16

- Any ATC radar facility can locate you and vector you; 121.5 and squawk 7700 exist for exactly this — asking early is airmanship, not failure.

Source: AIM 6-2-1

- Logging actual times over checkpoints is the raw material for un-losing yourself later: a current nav log is the anti-lost device.

Source: PHAK ch. 16

- The escalation triggers are concrete: fuel below plan, darkness coming, or weather lowering — any one of them means ask for help now or declare.

Source: AIM 6-1-2

- A lost airplane still needs flying: set safe altitude and power first, keep eyes out — circling a landmark head-down over a chart is a collision setup.

Source: AFH

- Unplanned fuel or power consumption while navigating (headwind, rich mixture, deviations) is caught by the checkpoint fuel log, and the response is the fuel decision point, not hope.

Source: PHAK ch. 16

- Performance numbers come from POH section 5 charts and tables, entered with actual weight, wind, temperature, and altitude — never from memory.

Source: POH/AFM sect. 5

- When conditions fall between table rows, interpolate — and when in doubt, round every input in the conservative direction.

Source: PHAK ch. 11

- The chart's conditions and notes are part of the data (paved level dry runway, flap setting, leaning technique); different conditions void the number.

Source: POH/AFM sect. 5

- Book performance was flown by test pilots in a new airplane; a worn trainer flown by a private pilot will not match it, so margin is added, not hoped for.

Source: AFH; PHAK ch. 11

- Pressure altitude is the altimeter reading with 29.92 set; it is the entry point for most performance charts.

Source: PHAK ch. 11

- Density altitude is pressure altitude corrected for nonstandard temperature: the altitude the airplane thinks it is at.

Source: PHAK ch. 11

- Standard sea-level atmosphere is 15 °C (59 °F) and 29.92 inHg (1013.25 hPa) — the yardstick every performance chart measures against.

Source: PHAK ch. 11

- Hot, high, or humid each raise density altitude alone — all three are not needed; a merely hot day at a low-elevation field has killed airplanes.

Source: AWH FAA-H-8083-28; NWS (1% guide)

- High density altitude cuts performance three ways at once: less lift from the wing, less thrust from the propeller, less power from the engine.

Source: PHAK ch. 11 (1% guide)

- A headwind component shortens takeoff and landing distance; a tailwind lengthens it far more per knot — the POH tailwind penalty always outweighs the headwind credit.

Source: POH/AFM sect. 5

- Only the wind components count: the crosswind chart splits reported wind into a headwind component and a crosswind component.

Source: PHAK ch. 11

- Published short- and soft-field performance assumes the POH technique exactly — speeds, flap setting, braking; sloppy speeds add distance no chart shows.

Source: POH/AFM; AFH

- Takeoff flaps per POH shorten ground roll but flatten climb; landing flaps steepen the approach and slow the touchdown.

Source: POH/AFM

- Grass, soft, wet, or contaminated runways add roll; where the POH gives correction factors they are used, and where it does not, margin covers the guess.

Source: POH/AFM notes

- Runway slope matters in both directions: uphill takeoff and downhill landing each lengthen the distance that is critical.

Source: PHAK ch. 11

- Ground effect reduces induced drag within about a wingspan of the surface: an overloaded or high-DA airplane can lift off in ground effect and still be unable to climb out of it.

Source: PHAK ch. 5/11 (1-5 principles)

- Forward CG: more stable and nose-heavy — higher stall speed, more flare force needed, lower cruise speed.

Source: PHAK ch. 10

- Aft CG: less stable, slightly faster cruise — and degraded stall and spin recovery.

Source: PHAK ch. 10

- CG behind the aft limit can make spin recovery impossible; it is the deadliest weight-and-balance error.

Source: PHAK ch. 10

- Stall speed rises with the square root of load factor: 60° of bank in level flight is 2 g, and stall speed grows about 41%.

Source: PHAK ch. 5 (1-5 principles)

- Stall speed rises with weight; every stall and performance table is keyed to a weight.

Source: POH/AFM sect. 5

- Weight times arm equals moment; CG equals total moment divided by total weight.

Source: PHAK ch. 10

- The datum is the manufacturer's reference line; every arm in the airplane measures from it.

Source: PHAK ch. 10

- Basic empty weight includes unusable fuel and (in modern GAMA-format POHs) full oil — confirm what your airplane's figure includes before using it.

Source: PHAK ch. 10; POH sect. 6

- The airplane's current weighing record and equipment list — not the POH sample problem — is the legal source of empty weight and moment.

Source: POH sect. 6; PHAK ch. 10

- Useful load is maximum weight minus basic empty weight: crew, passengers, baggage, and usable fuel all come out of it.

Source: PHAK ch. 10

- Avgas weighs 6 lb per US gallon; oil weighs 7.5 lb per gallon.

Source: PHAK ch. 10

- The loading envelope chart is the verdict: plot weight against CG or moment, and the point must sit inside the envelope.

Source: POH sect. 6

- Fuel burn moves both weight and CG in flight: a loading legal at takeoff can leave the envelope later — check takeoff and landing conditions both.

Source: PHAK ch. 10

- The weight-shift formula: weight moved times distance moved equals total weight times CG change.

Source: PHAK ch. 10

- Overweight operation costs everything at once: longer takeoff, shallower climb, higher stall speed, less structural margin — and it voids the performance charts.

Source: PHAK ch. 10/11

- Baggage-area placards are structural limits: the floor and tiedowns are certified only to the placarded weight.

Source: POH sect. 2

- Operating limitations bind wherever they appear: POH section 2, placards, and instrument markings all carry regulatory force.

Source: 14 CFR 91.9; POH sect. 2

- The airspeed limits: Vne never exceed (red line), Vno maximum structural cruise (top of green), Va maneuvering (not marked on the dial), Vfe maximum flaps extended (top of white).

Source: PHAK ch. 8; POH sect. 2

- Vy climbs give the most altitude per minute; Vx the most altitude per distance — obstacle-clearance planning uses Vx numbers.

Source: POH sect. 5; PHAK ch. 11

- Climb rate falls as you go up; service ceiling is the altitude where the best rate has decayed to 100 fpm.

Source: PHAK ch. 11

- The cruise-performance table links percent power, RPM, TAS, and fuel flow at each altitude and temperature — the same table feeds 2-1's fuel plan and 2-2's TAS.

Source: POH sect. 5

- Takeoff and landing "over a 50-ft obstacle" columns include the air segment; the ground-roll column alone understates the runway needed when anything stands off the end.

Source: POH sect. 5

- The performance-chart check is a per-flight event, not a per-airplane fact: a new field elevation, temperature, or load resets every number.

Source: PHAK ch. 11

- Runway and takeoff-path selection is a computed decision — aircraft performance and limitations, distance available, surface, and wind, weighed against pilot capability — made before taxi, not at the hold-short line.

Source: POH/AFM sect. 5; AFH (pin-needed)

- Density altitude follows the airplane around the pattern: a go-around at a high-density-altitude field may barely climb, so the go-around path and obstacle picture are part of the runway decision.

Source: PHAK ch. 11 (pin-needed)

- Class B draws as solid blue rings; each shelf is labeled ceiling-over-floor in hundreds of feet MSL (100/40 = 10,000 over 4,000).

Source: PHAK ch. 15; Chart User's Guide

- Class C dimensions: typically a 5-NM-radius surface core and a 10-NM shelf from about 1,200 to 4,000 ft above the airport.

Source: PHAK ch. 15

- The boxed Class D ceiling figure reads in hundreds of feet MSL; the airspace typically runs up to 2,500 ft above the field.

Source: PHAK ch. 15

- Class E to the surface draws as a dashed magenta circle around the airport.

Source: PHAK ch. 15

- Inside magenta vignette (shading), Class E begins at 700 ft AGL; outside it, Class E generally begins at 1,200 ft AGL.

Source: PHAK ch. 15

- Below the Class E floor is Class G — a thin layer at most airports, thicker in the mountain West.

Source: PHAK ch. 15

- Class A begins at 18,000 ft MSL everywhere: IFR clearance and instrument rating territory, with no VFR operations.

Source: PHAK ch. 15

- Airport symbol color is the tower key: blue airports have (or share) an operating control tower, magenta airports do not.

Source: Chart User's Guide

- Class G carries no ATC communication requirement; self-announcing on CTAF is procedure and good sense, not a legal entry gate.

Source: 14 CFR 91.126; AIM 4-1-9

- Class E en route has no communication requirement for VFR aircraft.

Source: 14 CFR 91.127

- Class D entry requires two-way radio communications established BEFORE entering, and maintained inside.

Source: 14 CFR 91.129(c)

- Class C entry takes the same established-communications test as D, plus an altitude-reporting transponder and ADS-B Out.

Source: 14 CFR 91.130(c); 91.215; 91.225

- Class B entry requires an explicit ATC clearance into the Class B — hearing your callsign is not enough.

Source: 14 CFR 91.131(a)

- Class B requires at least a private pilot certificate, or a student pilot with the specific ground and flight training and a logbook endorsement under 61.95, dated within the preceding 90 days and naming that Class B.

Source: 14 CFR 91.131(b); 61.95

- An altitude-reporting (Mode C) transponder and ADS-B Out are required in Class A, B, and C, and at and above 10,000 ft MSL except at and below 2,500 ft AGL.

Source: 14 CFR 91.215(b); 91.225

- The Mode C veil: within 30 NM of a listed Class B primary airport, surface to 10,000 ft MSL, transponder-with-altitude and ADS-B Out are required even under or outside the shelves.

Source: 14 CFR 91.215(b)(2); 91.225(d)(2)

- The speed cap below 10,000 ft MSL is 250 KIAS.

Source: 14 CFR 91.117(a)

- At or below 2,500 ft AGL within 4 NM of a Class C or D primary airport, the cap is 200 KIAS (does not apply inside Class B).

Source: 14 CFR 91.117(b)

- Under a Class B shelf or in a VFR corridor through Class B, the cap is 200 KIAS.

Source: 14 CFR 91.117(c)

- The everyday minimums ("3-152s"): Class C, D, and E below 10,000 ft MSL take 3 SM visibility and 500 below, 1,000 above, 2,000 ft horizontal from clouds.

Source: 14 CFR 91.155(a)

- Class B takes 3 SM and CLEAR of clouds — the exception that works because everyone inside holds an ATC clearance.

Source: 14 CFR 91.155(a)

- Class G in the daytime, at or below 1,200 ft AGL: 1 SM and clear of clouds.

Source: 14 CFR 91.155(a)

- Class G at night takes 3 SM and 500/1,000/2,000 — darkness strips away the Class G discount.

Source: 14 CFR 91.155(a)

- When the ceiling is under 1,000 ft, VFR flight beneath it is prohibited within the lateral boundaries of controlled airspace designated to the surface for an airport.

Source: 14 CFR 91.155(c)

- To take off, land, or enter the pattern inside a B/C/D/E surface area under VFR, ground visibility must be at least 3 SM (flight visibility 3 SM if ground visibility is not reported).

Source: 14 CFR 91.155(d)

- The preflight use of 91.155: destination METAR/TAF ceiling and visibility against the surface-area rule — 1,000 and 3 is the pair that decides whether the field is legally enterable VFR.

Source: 14 CFR 91.155(c)-(d)

- Cloud clearance buffers exist for see-and-avoid: an IFR aircraft can appear out of that cloud, and 500/1,000/2,000 is your reaction time.

Source: PHAK ch. 15

- Special use airspace prints on the sectional with hatched borders and an R-, P-, A-, or MOA label; the chart-edge panel gives its altitudes, times, and controlling agency — identify and check, with the operating rules in 3-5.

Source: Chart User's Guide; PHAK ch. 15

- TFRs never print on the sectional: they live in NOTAMs and current EFB overlays, which is why the NOTAM check is an airspace check.

Source: 14 CFR 91.103; AIM 3-5

- Shelf floors and ceilings on the chart are MSL numbers: convert against local terrain before ducking under a shelf that is lower above the ground than it looks.

Source: PHAK ch. 15

- The Class E floor is a minimums boundary too: below the vignette you hold G minimums (1 SM clear, day); climbing through 700 or 1,200 AGL the 3-152s attach.

Source: 14 CFR 91.155; PHAK ch. 15

- Airspace risk is a position problem: the ring only bites if you don't know you're in it — boundaries are fixed to landmarks and GPS overlays before flight.

Source: PHAK ch. 15

- Class A runs from 18,000 feet MSL up to and including FL600.

Source: AIM 3-2-2*

- Class A operations must be IFR under an ATC clearance — there is no VFR in Class A.

*Source: 91.135 eCFR**

- Class A requires transponder with Mode C and ADS-B Out.

*Source: 91.135(c), 91.215, 91.225 eCFR**

- Class B: surface to about 10,000 feet MSL around the busiest airports, individually tailored in layered shelves.

Source: AIM 3-2-3*

- Class B entry requires an ATC clearance before entering.

Source: 91.131(a)(1) eCFR*

- Two-way radio contact alone is not a Class B clearance — you need the words "cleared into Class Bravo."

Source: 91.131(a)(1); AIM* 3-2-3

- Class B equipment: two-way radio, transponder with Mode C, and ADS-B Out.

Source: 91.131(c),(d) eCFR*

- To take off or land in Class B, the PIC must hold at least a private certificate — or a student/recreational/sport pilot with the 61.94/61.95 training and endorsement.

Source: 91.131(b) eCFR*

- The Mode C veil: within 30 NM of a Class B primary airport, surface to 10,000 feet, transponder with Mode C and ADS-B Out are required.

Source: 91.215(b)(2), 91.225(d)(2) eCFR*

- Flying beneath a Class B shelf requires no clearance, but the veil's equipment rules still apply.

Source: 91.131, 91.215(b)(2) eCFR*

- Class C: airports with a tower and radar approach control — usually a 5 NM core from the surface to 4,000 feet above the airport, and a 10 NM shelf from 1,200 to 4,000 feet above it.

Source: AIM* 3-2-4

- Class C equipment: two-way radio, transponder with Mode C, and ADS-B Out.

Source: 91.130(d), 91.215, 91.225 eCFR*

- No specific pilot certification is required for Class C or D.

Source: AIM* 3-2-4, 3-2-5

- Class D: airports with an operating control tower — surface to about 2,500 feet above the airport, individually tailored.

Source: AIM* 3-2-5

- Class D requires only a two-way radio — no transponder or ADS-B from the class itself.

Source: 91.129 eCFR*

- Class E is all controlled airspace that is not A, B, C, or D.

Source: AIM* 3-2-6

- A magenta vignette means Class E begins at 700 feet AGL; a blue vignette means 1,200 feet AGL.

Source: AIM* 3-2-5/3-2-6

- A dashed magenta line is a Class E surface area — controlled airspace to the ground for an airport.

Source: AIM* 3-2-6

- Class E ends at, but does not include, 18,000 feet MSL.

Source: AIM* 3-2-6

- VFR flight in Class E has no entry or communication requirement — the control is for IFR separation.

Source: AIM* 3-2-6

- Federal airways (Victor airways) are Class E corridors from 1,200 feet AGL up to but not including 18,000 feet; width is commonly taught as 4 NM each side of the centerline.

Source: AIM* 3-2-6 (vertical extent); IPH* ch. 2 (width)

- Class G is uncontrolled airspace — everything not designated A through E.

Source: AIM* 3-2-1

- ATC exercises no control over VFR aircraft in Class G; the VFR minimums and right-of-way rules are the whole rulebook there.

Source: AIM*; 91.155 eCFR*

- Class G above 1,200 AGL and below 10,000 MSL, day: 1 statute mile; 500/1,000/2,000.

*Source: 91.155(a) eCFR**

- Class G above 1,200 AGL and below 10,000 MSL, night: 3 statute miles; 500/1,000/2,000.

*Source: 91.155(a) eCFR**

- Class G above 1,200 AGL and at or above 10,000 MSL: 5 statute miles; 1,000/1,000/1 statute mile.

*Source: 91.155(a) eCFR**

- Under a surface-designated controlled airspace ceiling below 1,000 feet, VFR flight beneath the ceiling is prohibited.

*Source: 91.155(c) eCFR**

- To take off, land, or enter the pattern under VFR in a B/C/D/E surface area, ground visibility must be at least 3 statute miles (flight visibility if none is reported).

*Source: 91.155(d) eCFR**

- Special VFR lets you operate below basic VFR minimums inside the lateral bounds of a surface area, below 10,000 feet MSL.

*Source: 91.157(a) eCFR**

- Special VFR requires an ATC clearance — and the pilot must ask; ATC never offers it.

Source: 91.157(b)(1) eCFR; AIM* 4-4-6*

- Special VFR minimums: 1 statute mile flight visibility, clear of clouds.

*Source: 91.157(b)(2),(3) eCFR**

- Special VFR takeoff or landing needs ground visibility of at least 1 statute mile — or flight visibility of 1 mile if ground visibility is not reported.

*Source: 91.157(c) eCFR**

- Special VFR between sunset and sunrise requires an instrument-rated pilot and an IFR-equipped aircraft.

*Source: 91.157(b)(4) eCFR**

- Prohibited areas (P-numbers) ban flight entirely for security reasons.

Source: AIM 3-4-2*

- Restricted areas (R-numbers) contain invisible hazards — artillery, gunnery, guided missiles; entry when active requires the controlling agency's authorization.

Source: AIM 3-4-3*

- Warning areas (W-numbers) carry restricted-area hazards over international waters, from 3 NM offshore outward.

Source: AIM 3-4-4*

- MOAs separate military training from IFR traffic; VFR flight may enter, but check activity and use extreme caution.

Source: AIM 3-4-5*

- Alert areas mark high volumes of training or unusual activity; no clearance needed, and every pilot shares collision-avoidance responsibility equally.

Source: AIM 3-4-6*

- Controlled firing areas suspend their activity when spotters see an aircraft coming — which is why they are not charted.

Source: AIM 3-4-7*

- SUA times, altitudes, and controlling agencies print on the chart margin; live status comes from FSS, the controlling agency, or the FAA SUA site.

Source: AIM 3-4-9*

- TFRs are issued by NOTAM — they never appear on the printed chart.

*Source: 91.137(a) eCFR**

- 91.137 TFRs protect three things: people and property near a surface hazard, disaster relief aircraft, and the airspace over events that draw sightseers.

*Source: 91.137(a)(1)-(3) eCFR**

- Large sporting events carry a standing security TFR (commonly 3 NM and 3,000 feet AGL over major stadium events); the exact terms live in the current FDC NOTAM, so check it — the figures are not in a regulation.

*Source: standing FDC NOTAM (check current NOTAM at briefing); 99.7 eCFR**

- Presidential and VIP TFRs move with the person; violating one gets an armed escort.

*Source: 91.141 eCFR**

- Checking TFRs is part of every preflight: briefing output plus tfr.faa.gov; EFB overlays help but can lag.

*Source: 91.103; 91.137 eCFR**

- Entering an ADIZ requires a filed and activated flight plan — DVFR for a VFR flight.

*Source: 99.11 eCFR**

- ADIZ operations require a functioning two-way radio with a continuous listening watch.

*Source: 99.9(a) eCFR**

- ADIZ operations require an operating transponder with altitude reporting.

*Source: 99.13 eCFR**

- Flying VFR within 60 NM of the Washington DC VOR requires the FAA's DC SFRA special awareness training.

Source: AIM 3-5-8; 91.161 eCFR**

- Special flight rules areas (DC, Grand Canyon, and others) carry their own part 93 rules — read them before going near.

Source: AIM 3-5-7; 14 CFR 93*

- A TRSA offers voluntary radar services to VFR aircraft — it is not a regulatory airspace class.

Source: AIM 3-5-6*

- Transponder with Mode C is required at and above 10,000 feet MSL (except at and below 2,500 AGL), everywhere in the 48 states.

*Source: 91.215(b)(5)(i) eCFR**

- The airspace boundary is where the airplane is, not where the pilot thinks it is — fix position against the chart before the line, every time.

Source: NA; PA.I.E.R1

- The riskiest airspace is the kind you did not know was there: preflight the whole route's airspace, including what a diversion would enter.

Source: NA; PA.I.E.R1

GOING DEEPER

- VFR cruising altitudes key to magnetic course, not heading: the wind correction you fly never changes which altitudes are legal.

Source: 14 CFR 91.159

- A fuel decision point is computed before flight: a named point where, if fuel is below plan, the flight lands and refuels — the decision is made on the ground, not renegotiated in the air.

Source: AC 91-92 §8 doctrine

- An abort point is chosen before takeoff: a spot on the runway where, if the airplane is not flying or not accelerating on plan, the takeoff stops.

Source: AFH