

PRIVATE PILOT GROUND SCHOOL

MODULE 4-3 — CHECKRIDE WEEK 3: TASK C

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FACTS TO REMEMBER

KNOW THESE COLD

- The regulatory driver for weather briefing is 91.103: weather reports AND forecasts are required preflight information for any flight away from the airport's vicinity.

Source: 14 CFR 91.103(a)

- The two official outlets are aviationweather.gov (Aviation Weather Center) for products and Flight Service (1800wxbrief.com / 1-800-WX-BRIEF) for briefings.

Source: AIM 7-1-5; AC 91-92

- A self-briefing from official sources is regulatorily compliant — a phone call to a briefer is one way to meet 91.103, not the only way.

Source: AIM 7-1-5a; AC 91-92

- Weather can be updated in flight — Flight Service by radio and FIS-B datalink — but nothing available in flight replaces the preflight briefing.

Source: AIM 7-1-5f; AC 00-63B

- A standard briefing is the complete picture, requested closest to departure time, for any flight.

Source: AIM 7-1-5

- An abbreviated briefing updates an earlier briefing or answers specific items — it rides on top of a standard one, never in place of it.

Source: AIM 7-1-5

- An outlook briefing applies when departure is six or more hours away, and it is for planning purposes only.

Source: AIM 7-1-5d

- An outlook briefing is never a launch briefing: get a standard briefing near departure time.

Source: AIM 7-1-5d (1% material)

- A briefer (or self-brief form) needs: aircraft ID and type, VFR, departure point and time, route, altitude, destination, and ETE.

Source: AC 91-92

- A briefing is weather plus aeronautical information: NOTAMs and TFRs ride in it, so a blue-sky day can still be a no-go on a runway closure or a TFR.

Source: AC 91-92

- "VFR flight not recommended" is advisory in nature; the go/no-go decision rests solely with the pilot — it is a strong data point, not an order.

Source: AIM 7-1-5b

- The self-brief runs in a fixed order: synopsis, then hazards, then current weather, then forecasts, then winds, then decide and document.

Source: AC 91-92 (Erick doctrine, depth std.)

- A METAR is a routine surface observation, typically hourly: it is history, not forecast.

Source: AWH FAA-H-8083-28

- A SPECI is an unscheduled special observation: its existence alone says something changed fast.

Source: AWH FAA-H-8083-28

- METAR wind reads dddffKT in degrees true and knots; G marks gusts, VRB variable, 00000KT calm.

Source: AWH FAA-H-8083-28

- METAR visibility is in statute miles, including fractions (1 1/2SM).

Source: AWH FAA-H-8083-28

- Weather codes carry an intensity prefix: minus is light, none is moderate, plus is heavy — and the letter pairs are learnable (RA rain, SN snow, BR mist, FG fog, HZ haze, TS thunderstorm).

Source: AWH FAA-H-8083-28

- Sky condition comes in eighths: FEW 1–2, SCT 3–4, BKN 5–7, OVC 8, with heights in hundreds of feet AGL.

Source: AWH FAA-H-8083-28

- A ceiling is the lowest broken or overcast layer (or vertical visibility); scattered is not a ceiling.

Source: AWH FAA-H-8083-28

- Temperature and dewpoint report in whole degrees Celsius; an M prefix means below zero.

Source: AWH FAA-H-8083-28

- A closing temperature–dewpoint spread across successive METARs is the fog warning: a small spread on a clear, calm evening reads "expect fog by morning."

Source: AWH FAA-H-8083-28 (mechanism -> 3-3)

- The altimeter group (A2992 = 29.92 inHg) is set before flight, and the altimeter should then read field elevation.

Source: AWH FAA-H-8083-28

- The briefing covers stations along the whole route, not just the endpoints: en route METARs are where the surprise lives.

Source: AC 91-92

- A TAF is an aerodrome forecast for the area within 5 SM of the airport — it says nothing about the en route segment.

Source: AWH FAA-H-8083-28

- TAFs issue four times daily on the 6-hour cycle, valid 24 hours (30 at some airports).

Source: aviationweather.gov TAF docs

- TAF groups read day-plus-hour Zulu: the header carries issuance time and a ddhh/ddhh validity window.

Source: AWH FAA-H-8083-28

- FM means a rapid change to a new prevailing condition at that time.

Source: AWH FAA-H-8083-28

- BECMG means a gradual change spread across the stated window.

Source: AWH FAA-H-8083-28

- TEMPO means temporary fluctuations, each lasting less than an hour and covering less than half the period.

Source: AWH FAA-H-8083-28

- PROB30 marks a 30-percent chance of the bracketed conditions in that window — low odds, real enough to plan around.

Source: AWH FAA-H-8083-28

- The flight-category quick look: VFR is ceiling above 3,000 and visibility above 5; MVFR 1,000–3,000 and/or 3–5; IFR 500 to below 1,000 and/or 1 to below 3; LIFR below 500 and/or below 1.

Source: AIM 7-1-7

- MVFR is a decision zone, not a green light: legal VFR can still sit below personal minimums.

Source: AIM 7-1-7; personal minimums doctrine

- The briefing's adverse-conditions section is the no-go trigger list: known or forecast icing or turbulence aloft, or convection, in a non-deiced trainer reads "no" — before any product decoding.

Source: AC 91-92; AWH FAA-H-8083-28

- Winds aloft from the briefing feed the nav log, and a strong disagreement between winds aloft and surface wind warns of shear and turbulence in the climb and descent.

Source: AWH FAA-H-8083-28 (decode -> 3-4)

- Personal weather minimums are written numbers — ceiling, visibility, wind and crosswind — set before flight, sitting above the legal minimums.

Source: AC 91-92 §8.2; NA Personal Minimums Sheet

- The personal-minimums comparison is mechanical: forecast versus the written number; the number does not renegotiate on the ramp.

Source: NA Personal Minimums Sheet (internal)

- Weather worse than briefed and trending below personal minimums IS the circumstance that makes diversion prudent — recognizing it is 2-4's job; flying the diversion is 1-16's.

Source: AC 91-92

- Every product has an age: a METAR is minutes to an hour old, and a forecast's confidence decays through its period — check issue times, not just contents.

Source: AWH FAA-H-8083-28

- The go/no-go is stated as a conclusion falling out of the framework — brief, compare, decide, document — never as a feeling about the sky.

Source: AC 91-92 (Erick doctrine, depth std.)

- Air pressure is how often and how hard air molecules strike a surface.

Source: NWS JetStream; AWH TC

- Warm air is less dense than cool air: in the open atmosphere, heated molecules move faster and spread farther apart.

Source: NWS JetStream TC

- Air density is determined by pressure, temperature, and humidity.

Source: NWS TC

- Humid air is less dense than dry air — a water molecule weighs less than the nitrogen or oxygen molecule it displaces.

Source: NWS; Dalton/Avogadro TC

- Any one of high, hot, or humid raises density altitude — all three are not required.

Source: TC (misconception #3)

- The atmosphere is about 78 percent nitrogen, 21 percent oxygen, and 1 percent other gases including water vapor.

Source: AWH ch. 2 TC

- Nearly all weather happens in the troposphere, the lowest layer.

Source: AWH TC

- Temperature normally falls with altitude at an average of about 2°C per 1,000 feet — the standard (environmental) lapse rate.

Source: AWH ch. 6 TC

- Rising air cools by expansion with no heat exchange — the adiabatic process that builds every cloud.

Source: NWS "How Clouds Form"; AWH TC

- Radiation fog: clear night, light wind, moist air — forms in low spots, burns off after sunrise.

Source: AWH ch. 18 TC

- Advection fog: moist air flowing over a cooler surface — needs wind, can persist for days and move onshore at night.

Source: AWH ch. 18 TC

- Upslope fog: moist air cooled adiabatically as terrain forces it up.

Source: AWH ch. 18 TC

- Precipitation-induced (frontal) fog forms when rain saturates the cold air beneath a front.

Source: AWH ch. 18 TC

- Smoke, dust, and blowing obscurations cut visibility fastest in stable air that holds them near the surface.

Source: AWH ch. 21 TC

- Never fly through volcanic ash — it destroys engines and abrades windscreens; avoid by wide margins.

Source: AWH TC

- Sinking air warms by compression, which is why descending air dries out.

Source: NWS; AWH TC

- Dry adiabatic lapse rate: about 3°C per 1,000 feet for unsaturated rising air.

Source: AWH ch. 6 TC

- Saturated rising air cools more slowly (roughly 1.2–3°C per 1,000 feet) because condensation releases latent heat.

Source: AWH TC

- The environmental lapse rate is the measured temperature profile of the actual air — a different quantity from the adiabatic rates a parcel follows.

Source: AWH ch. 13; TC (misconception #2)

- Dewpoint is the temperature air must cool to for saturation — the real moisture number.

Source: NWS La Crosse; AWH TC

- The temperature–dewpoint spread predicts fog, cloud bases, and structural ice before they appear.

Source: AWH ch. 6/12 TC

- In a rising convective parcel the spread closes about 2.5°C per 1,000 feet, so cumulus bases sit near $(\text{spread} \div 2.5) \times 1,000$ feet.

Source: AWH ch. 6/12 TC

- Relative humidity changes with temperature even when moisture does not — dewpoint, not RH, is the measure to plan with.

Source: NWS La Crosse TC (misconception #7)

- Warmer air can contain more water vapor.

Source: NWS TC

- Cloud droplets form when vapor condenses onto condensation nuclei in cooling air.

Source: NWS TC

- Condensation releases latent heat, and that release is the fuel of thunderstorms.

Source: AWH TC

- Freezing rain at your altitude means a warmer-than-freezing layer is above you.

Source: AWH TC

- Frost forms by deposition: on clear, cold nights the surface cools below both freezing and the dewpoint.

Source: AWH ch. 20 TC

- All frost, ice, and snow must be removed from lift surfaces before flight.

Source: AWH ch. 20 TC

- Stability is the atmosphere's resistance to vertical motion — it either enhances or suppresses rising air.

Source: AWH 13.1 TC

- The parcel test: a lifted parcel that stays warmer than its surroundings keeps rising; one that turns cooler sinks back.

Source: NWS Parcel Theory; AWH 13.2 TC

- An inversion — temperature rising with height — marks strongly stable air.

Source: AWH 5.8.3 TC

- Inversions trap haze, smoke, and pollutants; expect smooth air but poor visibility beneath them.

Source: AWH TC

- Stable air signature: smooth, stratiform clouds, steady precipitation, poor visibility.

Source: AWH TC

- Unstable air signature: turbulence, cumuliform clouds, showery precipitation, good visibility.

Source: AWH TC

- A stagnant high-pressure system can mean bad VFR — the inversion under a high traps haze for days.

Source: TC (misconception #6)

- Uneven heating of the Earth's surface is the root driver of all weather.

Source: AWH TC

- Land heats and cools faster than water.

Source: AWH TC

- Sea breeze: daytime flow from the cool water toward the heated land.

Source: AWH TC

- Land breeze: nighttime flow from the cooled land toward the warmer water.

Source: AWH TC

- Clear, calm nights radiate surface heat away, setting up surface inversions and radiation fog.

Source: AWH TC

- Wind is air sliding from high pressure toward low pressure.

Source: NWS Origin of Wind TC

- Coriolis force turns moving air to the right in the Northern Hemisphere.

Source: NWS TC

- Above the friction layer, wind blows roughly parallel to the isobars.

Source: AWH TC

- Surface friction slows the wind and angles it across the isobars toward low pressure.

Source: AWH TC

- Northern Hemisphere circulation: clockwise and outward around highs, counterclockwise and inward around lows.

Source: NWS TC

- Air sinks in highs and dries out; air rises in lows and clouds up.

Source: NWS TC

- Closely spaced isobars mean a steep pressure gradient and strong wind.

Source: AWH TC

- Mountain waves form when strong wind crosses a ridge into stable air on the far side.

Source: AWH 16.2 TC

- Wind shear can occur at any altitude and in any direction — it is not only a thunderstorm product.

Source: AWH ch. 19 TC

- Frontal passage, thunderstorms, inversions, and terrain all produce low-level shear.

Source: AWH TC

- A shear that removes headwind on final costs airspeed and lift at the worst possible time.

Source: AWH TC

- An air mass takes on the temperature and moisture of the region it forms over.

Source: AWH 11 TC

- A front is the boundary zone between two air masses — a zone with depth, not a wall.

Source: AWH 11.3; TC (misconception #10)

- Frontal passage signs: wind shift, temperature change, and a pressure fall then rise.

Source: AWH 11.3 TC

- Cold front: steep and fast — a narrow band of showery, sometimes violent weather, then rapid clearing.

Source: AWH 11.3.2 TC

- Squall lines — solid lines of severe storms — can form ahead of fast cold fronts.

Source: AWH 11.3.2 TC

- Warm front: shallow and slow — widespread layered cloud and steady precipitation arriving far ahead of the surface front.

Source: AWH 11.3 TC

- Ahead of a warm front the clouds lower and thicken in sequence as the front approaches.

Source: PHAK cloud families TC (attribution caveat)

- Winter warm fronts are the freezing-rain factory: rain falls from the warm layer aloft into freezing air below.

Source: AWH TC

- Stationary front: little movement, prolonged weather along the boundary.

Source: AWH 11.3 TC

- Occluded front: a faster cold front overtakes a warm front and lifts it, mixing both fronts' weather.

Source: AWH 11.3.4 TC

- "Nimbo" in a cloud name means it is producing precipitation.

Source: AWH ch. 12 TC

- Cumulus forms read as instability; stratus forms read as stability.

Source: AWH TC

- Towering cumulus signals strong convective turbulence and possible storm development.

Source: AWH TC

- Turbulence has four causes: convective, mechanical, frontal, and wind shear.

Source: AWH ch. 19 TC

- Turbulence intensities are defined terms: light, moderate, severe, extreme.

Source: AWH 19.1 TC

- A thunderstorm needs three ingredients: moisture, instability, and a lifting action.

Source: NWS; AWH 22 TC

- Life cycle: cumulus stage (updrafts), mature stage (precipitation begins, updrafts and downdrafts together), dissipating stage (downdrafts).

Source: AWH 22.3 TC

- The mature stage is the most violent, and surface precipitation marks its start.

Source: AWH 22.3 TC

- Avoid severe storms by at least 20 miles, and do not fly between echoes less than 40 miles apart.

Source: AWH 22.8.2 TC

- Never fly under a thunderstorm or under its anvil.

Source: AWH 22.8.2 TC

- Never fly into a cloud mass containing embedded thunderstorms without airborne radar.

Source: AWH 22.8.2 TC

- A microburst is a small, intense downdraft — descent rates to 6,000 feet per minute.

Source: AWH TC

- Flying through a microburst swings you from headwind to tailwind — a 30-to-90-knot airspeed loss.

Source: AWH TC

- Structural icing needs two things: visible moisture and aircraft surface temperature at or below freezing.

Source: AC 91-74B TC

- Clear ice: large supercooled drops (freezing rain) spread before freezing — heavy, hard, hard to see.

Source: AC 91-74B; AWH TC

- Rime ice: small drops freeze on impact — rough, milky, builds on leading edges.

Source: AC 91-74B; AWH TC

- Freezing rain produces the fastest ice accumulation of any condition.

Source: AWH TC

- Carburetor ice is a warm-day hazard: most likely below about 70°F in humid air, possible up to 100°F — not a freezing-weather problem.

Source: PHAK ch. 7 TC (misconception #8)

- Fog is a cloud at the surface: visibility below 5/8 statute mile.

Source: AWH ch. 18 TC

- Fog rarely forms until the temperature–dewpoint spread closes to about 2°C or less.

Source: AWH TC

- The Aviation Weather Center is the product source; Leidos Flight Service is the briefing and consultation service; EFB apps aggregate both.

Source: AC 91-92; AIM* 7-1-5 TC

- A regulatory-compliant briefing does not require calling Flight Service — a documented self-briefing can comply.

Source: AIM* 7-1-5a; AC 91-92 TC

- Flight Watch and HIWAS no longer exist; today's inflight sources are FSS on 122.2, FIS-B, and ARTCC hazardous-weather broadcasts.

Source: AIM* 7-1-5f, 7-1-8 TC

- ARTCC broadcasts hazardous weather advisories on center frequencies; ask the controller for details.

Source: AIM* 7-1-8 TC

- A PIREP is the only direct observation of conditions aloft; UA marks routine, UUA marks urgent.

Source: AWH 24.5 TC

- PIREP decode runs on slash codes: /OV location, /TM time, /FL altitude, /TP type, /SK sky, /TA temperature, /WV wind, /TB turbulence, /IC icing.

Source: AWH 24.5 TC

- Pilots are expected to volunteer PIREPs — reporting unforecast conditions helps the NWS verify and fix

forecasts.

Source: AWH 24.5.1; AIM 7-1-18b TC*

- AIRMETs advise of widespread conditions hazardous especially to VFR pilots and operators of sensitive aircraft.

Source: AWH ch. 26 TC

- AIRMET Sierra: IFR conditions and mountain obscuration.

Source: AWH ch. 26 TC

- AIRMET Tango: moderate turbulence and strong surface winds.

Source: AWH ch. 26 TC

- AIRMET Zulu: moderate icing and freezing level.

Source: AWH ch. 26 TC

- A SIGMET warns of non-convective conditions severe for all aircraft: severe icing, severe or extreme turbulence, dust or sandstorms, volcanic ash.

Source: AWH ch. 26 TC

- A Convective SIGMET covers severe thunderstorms, embedded thunderstorms, and lines of storms.

Source: AWH ch. 26 TC

- Any Convective SIGMET implies severe or greater turbulence, severe icing, and low-level wind shear.

Source: AWH (verbatim rule) TC

- The Graphical Forecasts for Aviation (GFA) is the interactive replacement for the old text Area Forecast over the CONUS.

Source: AWH TC

- The Surface Analysis Chart shows observed pressure systems and front positions — what is, not what will be.

Source: AWH 25.2.3 TC

- Prog charts show forecast front and pressure positions at future times.

Source: AWH ch. 25 TC

- Winds and Temperatures Aloft (FB): direction in tens of degrees TRUE, speed in knots, temperature in Celsius.

Source: AWH 27.2.1 TC

- FB blanks: no wind forecast within 1,500 feet of station elevation; no temperature within 2,500 feet.

Source: AWH 27.2.1 TC

- FB code 9900 means light and variable.

Source: AWH 27.2.1 TC

- The SPC Convective Outlook grades storm risk: TSTM, MRGL, SLGT, ENH, MDT, HIGH.

Source: SPC/NWS TC

- Scheduled TAFs are issued four times daily, every six hours.

Source: AWH TC

- An amended TAF (TAF AMD) supersedes and cancels the previous TAF — always check for the amendment.

Source: AWH (verbatim) TC

- Weather radar (NEXRAD) shows precipitation, not clouds — an empty radar picture is not proof of VMC.

Source: AWH 22.8.2 TC

- Satellite imagery shows clouds; radar shows precipitation — two different questions.

Source: AWH TC

- Datalink radar is always at least 7 to 8 minutes older than its time stamp.

Source: AC 00-63B (verbatim) TC

- Datalink weather is for broad strategic avoidance only — never for tactical storm penetration.

Source: AC 00-63B TC

- FIS-B is free over 978 UAT ADS-B In: METARs, TAFs, NEXRAD, AIRMETs, SIGMETs, NOTAMs, and more.

Source: AIM 7-1-9; AC 00-63B App A TC*

- FIS-B does not replace a preflight briefing.

Source: AC 00-63B TC

- An outlook briefing is for planning only — get a standard briefing closer to departure.

Source: AIM 7-1-5d; AC 91-92 8.1 TC*

- "VFR flight not recommended" is advisory — the final decision rests solely with the pilot, which is why it must be taken seriously, not outsourced.

Source: AIM 7-1-5b TC*

- A clean current METAR does not override a worsening TAF — the trend outranks the snapshot.

Source: TC (misconception #5; ratified trend element)

- Read improving versus deteriorating from the METAR sequence, the TAF's BECMG/TEMPO groups, front movement, and the closing spread.

Source: TC (ratified trend element)

- Every weather product has a valid time and an issue time — reading one without the other is reading fiction.

Source: AWH ch. 24-27 TC